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# ELECTRICAL WORLD

*A consolidation of Electrical World, Electrical Engineer and American Electrician*

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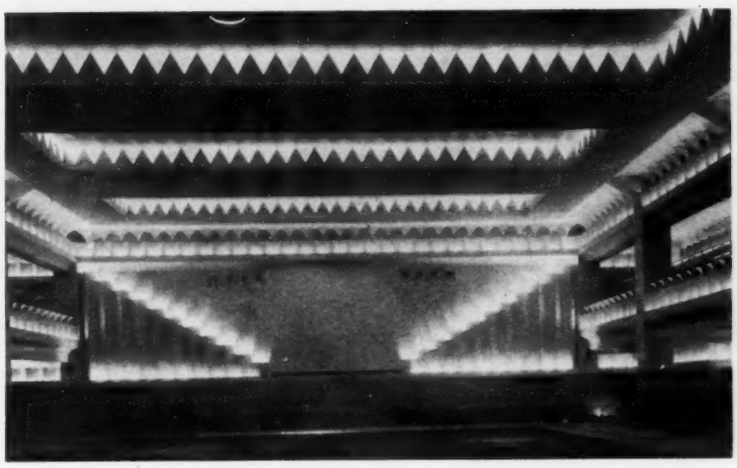

*Ballroom lighting St. George Hotel, Brooklyn, N. Y.*

NOVEMBER 8, 1930

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# Tree Limbs Are Now Bare of Leaves

NOW is the opportune time to survey your overhead construction and clear up all the places where storms may start tree trouble. A little trimming here and there and a length of tree wire in each of the really bad places will insure uninterrupted service during the anticipated bad weather. It is much cheaper to repair it now than to shoot trouble after it happens.

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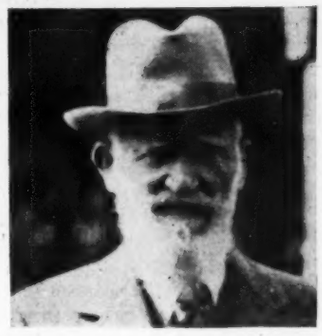
# ELECTRICAL WORLD

*for the Week Ending*

November 8, 1930



*I rejoice in the new universe that Einstein has produced, but I don't know how long it will last. Science is always wrong; it is the very artifice of men. Science can never solve one problem without raising ten more problems.*

BERNARD SHAW,
Playwright, World Citizen.

## Election Day brings utility upsets

## Drought peril removed in Northwest

## Fire losses affecting Trade hearings

## Boston sells ranges on installed basis

—**Federal Trade losses in fire** last August included pre-hearing reports of thirteen utility organizations. Commission will resume hearings next Monday with Southeastern Power & Light. *Page 850.*

—**Ranges sold at list, installed,** by Boston Edison company. Spokane does so too. Here is a definite move to encourage the householder. Why make the consumer pay high installation costs? *Page 850.*

—**Alabama sues utility for tax,** claiming levy due on 1929 operations. Alabama Power Company has refused to pay privilege tax on export energy from hydro plants. *Page 853.*

—**Country swings to Democrats.** Radical Republicans win in many states. Public ownership measures in Oregon, Washington and Nebraska carried. New York gave Roosevelt over 725,000 plurality and wiseacres foresee his 1932 chances for presidency gleaming. Pinchot wins in Pennsylvania. Stock market reacts. *Page 848.*

—**Holding company vindicated** on its past record, contends Martin J. Insull in tracing growth of the idea and benefits realized. "Holding investment company" the accurate name, he maintains. *Page 858.*

—**No drought peril in Northwest,** reports now indicate. Last year's danger spots have been eliminated by the building of new hydro plants in several localities. *Page 850.*

—**French rural Electrification** proceeds under state and local department subsidy. Farm users constitute 15 per cent of total population. *Page 877.*

—**Off-peak water-heating load** again offered as one of industry's greatest opportunities for securing even distribution of energy. Boston Edison's technical adviser urges promotion. *Page 863.*

# NEWS OF THE WEEK

## Radicalism on Public Utility Issues Wins in East and West

SWINGING backward with a momentum greatly accelerated by hard times, the political pendulum this week not only registered the probable loss of administration control in the House of Representatives and augmented uncertainty of legislative action in the Senate but also recorded specific victories in both national and state contests by men of radical opinions on utility ownership and regulation which cannot fail to interest the power industry.

Among these as regards Congress are the re-election in Nebraska of Senator Norris, foremost champion of public ownership; in Michigan of Senator Couzens, advocate of federal regulation over interstate transmission, and in Montana of Senator Walsh, father of the Federal Trade Commission investigation.

The tremendous victory of Governor Roosevelt in New York foreshadows a determined effort on his part to carry his St. Lawrence hydro-electric plans to fruition, and his success or failure here, as well as in guiding the policy of the State Public Service Commission, will react strongly upon the presidential situation two years hence.

Election of Gifford Pinchot as Governor of Pennsylvania on the Republican ticket against much opposition from business interests which usually support that party probably means a revival in some shape of the "giant power" scheme that he fathered during his previous term as well as an endeavor to reconstitute the regulatory commission of the Keystone State.

The election as Senator from Colorado of Edward P. Costigan, radical Democrat, whose statements regarding alleged political activities and expenditures of the Public Service Company of Colorado were declared "absolutely untrue" by Vice-President C. N. Stannard of that company in large newspaper advertisements, is another occurrence of interest, as is the unexpected victory for the governorship of Connecticut of Dean W. L. Cross of Yale, who found fault with the exercise of party leadership by J. Henry Roraback, president of the Connecticut Light & Power Company.

The three-sided gubernatorial contest in Oregon resulted in the election of Julius L. Meier, the independent candidate, on the radical program outlined last week. In the First Congressional District of Tennessee Representative B. Carroll Reece, who voted against the Norris Muscle Shoals bill, was also defeated by an independent, despite the backing of the President, which had attracted national attention to the contest.

▼ ▼ ▼

### PROMINENT DEDICATORS OF SOUTH AMBOY (N. J.) STATION

**Front row, left to right—Martin J. Insull, president Middle West Utilities Company; Morgan F. Larson, Governor of New Jersey; T. R. Crumley, president Jersey Central Power & Light Company; W. A. Jones, president, and Paul Clapp, managing director of the N.E.L.A., and Harry Reid, president National Electric Power Company.**

*Martin J. Insull made the chief address at the dedication of the Jersey Central Power & Light Company's 50,000-kw. South Amboy plant on October 31. He defended the holding company.*

The district power bills in Oregon and Washington won by good majorities, as did the Nebraska bill. San Francisco, however, veered away from public ownership and the Los Angeles bond issue fell short of the required vote.

Boston voters decided by 17,000 plurality against public ownership of the elevated railways and for continuance of the present system of control.

### How the direct votes resulted

Results of the various referendums and direct votes listed by the ELECTRICAL WORLD last week (pp. 804-6) as to occur in Oregon, Washington, California and Nebraska are contained in the following dispatches received by this paper from its regular correspondents on Thursday morning:

PORTLAND, ORE.—Hostility toward the power industry under private ownership and management is reflected in the vote in Oregon and Washington, where measures looking toward the formation of utility districts for public development of power have apparently passed. In addition, the overwhelming majority vote cast for Julius L. Meier for Governor of Oregon over the combined votes given to the regular Republican, Democratic and Socialist candidates is another reflection of this public attitude, since Mr. Meier's campaign was built largely around various phases of the power issue inimical to the industry.

In Oregon the district power bill will apparently pass in the ratio of about one and a half to one. Unofficial returns from 1,132 precincts out of 1,909 in the State give the bill a majority of about 27,000.

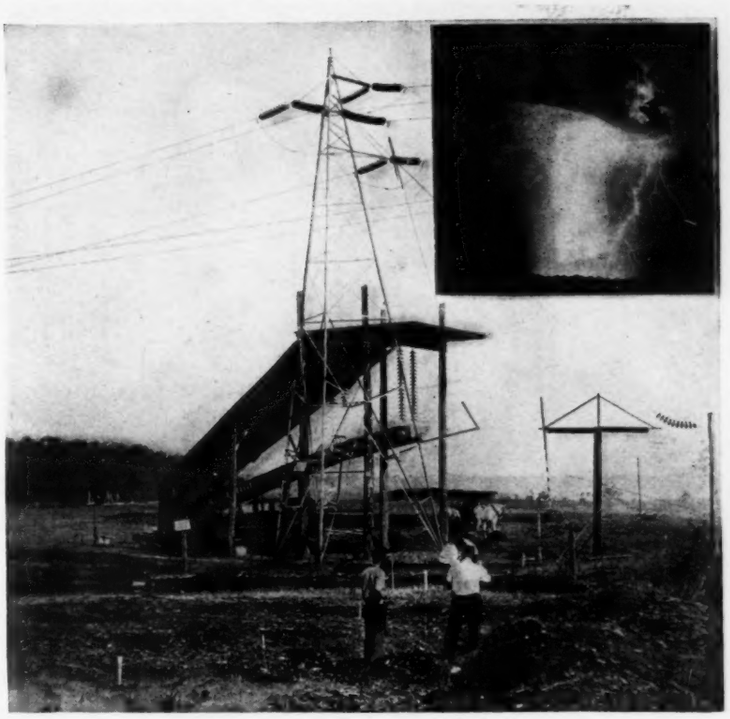
Swept into office with Meier were a number of legislative candidates favoring some form of state or federal development of power. In Portland R. C. Clyde, aggressively in favor of municipal ownership, received an overwhelming plurality for City Commissioner in a field of eleven. Significant also was the election of General Charles H. Martin, Democrat, to a seat in the House of Representatives, defeating Franklin Korell, Republican incumbent. General Martin's first platform plank advocated a national policy favorable to state development of hydro-electric resources.

SEATTLE, WASH. — With about three-quarters of the precincts in Washington reporting, the district power bill, permitting the formation of public utility districts for the purpose of building, acquiring through condemnation or purchasing power plants and distributing the power, appears to have been carried by a substantial majority. Two thousand two hundred and fifty-four scattered precincts of the 2,716 in the state cast a vote of 126,218 for the bill and 110,515 against it.

SAN FRANCISCO, CALIF.—San Francisco voters decisively defeated the proposed elective public utilities commission: Yes, 37,603; no, 73,480. To the policy of municipal ownership also a blow was dealt by approval of a charter amendment granting a 25-year operating permit to the Market Street Railway: Yes, 80,689; no, 64,735.

LOS ANGELES, CALIF. — The proposed municipal power bond issue of $13,300,000 failed to obtain the two-thirds majority required for passage. Returns from 1,835 out of 1,852 precincts give: Yes, 124,736; no, 102,106.

## LIGHTNING ON THE BANKS OF THE MUSKEGON



*General Electric and Consumers' Power engineers have set up a portable lightning generator at Croton Dam, Mich., where a 40-mile 110-kv. transmission line, not now in use, furnishes a target for artificial thunderbolts of up to 1,500 kv. Real lightning breaking over the dam is shown in the insert.*

▼ ▼ ▼

LINCOLN, NEB.—Partial returns indicate that Nebraska voters have adopted the initiated law giving to municipalities the right to extend electric power lines and to purchase power plants by pledging future earnings through councilmanic action. The law also forbids sale of public plants except by a 60 per cent vote. The proposal is getting a two-to-one vote, indicating that it will receive more than the necessary 35 per cent of the total. The conflicting proposal requiring a vote of the people is also receiving a majority. But as the affirmative vote does not equal that of the first proposal, the latter will become effective.

▼

## First 50,000-Kw. Unit at Ashtabula Goes In

AT ASHTABULA, OHIO, on Wednesday last the Cleveland Electric Illuminating Company placed in operation the first generating unit of 50,000 kw. capacity in its new power plant, 50 miles east of Cleveland. Second and third units of similar size are nearing completion and will be placed in operation at an early date. Ultimate capacity will be 400,000 kw., provided by eight 50,000-kw. units. The Ashtabula plant is interconnected by a 132-kv. transmission system with the company's plants in Cleveland and Avon and increases the combined generating capacity of the spstem to 497,000 kw.

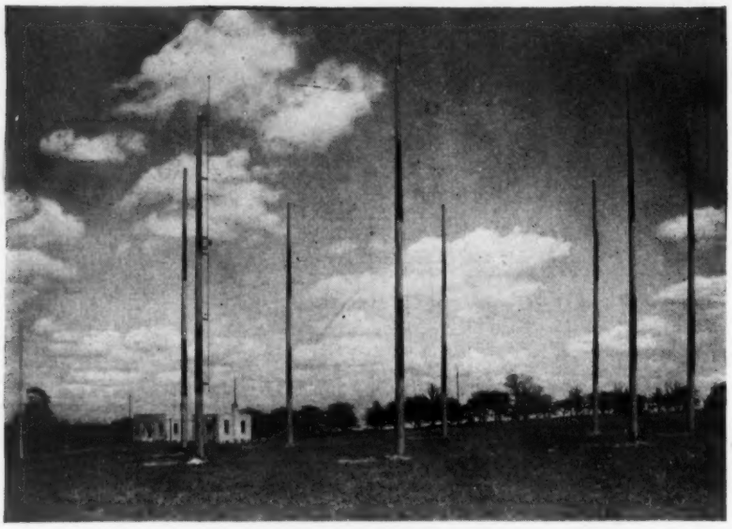
▼

## Attack Holding Company in New Hampshire

RESUMPTION OF HEARINGS at Concord, N. H., by the New Hampshire Public Service Commission into matters affecting the New Hampshire Gas & Electric Company and the Derry Electric Company brought out on Wednesday an attack by State Counsel Louis E. Wyman upon the Associated Gas & Electric System, of which the operating companies form part.

Mr. Wyman declared that there was a desire "to avoid full performance of duty in rendering best possible service at lowest rates." He charged that the owners have designedly created "a cloud of corporations" and that the different organizations have no real separate identity which ought to be recognized by a regulatory body. In addition, he charged violation of a state law with reference to issuance of securities.

## BROADCASTING REACHES TENTH ANNIVERSARY



*The first decade of radio broadcasting was completed on Monday of this week. On November 3, 1920, Westinghouse radio station KDKA announced the election of President Harding, and it has not missed a day since. Above is the new 400-kw. transmitting station at Saxonburg, Pa., with the short-wave antenna system.*

▼ ▼ ▼

## Spier Falls, New Unit Goes on the Lines

POWER RESOURCES of the New York Power & Light Corporation were increased by 57,000 hp. on Wednesday, when a new generator at the Spier Falls hydro-electric plant started on its operating career one month ahead of schedule. The addition of this machine will give Spier Falls a capacity of 100,000 hp., making it the largest hydro-electric station in the state with the exception of the Schoellkopf station at Niagara Falls. Its completion gives the Niagara-Hudson system a capacity of nearly 2,000,000 hp. The waterwheel is 20 ft. in diameter and during the low-water period will take the entire flow of the Hudson River.

▼

## Drought Peril on Coast Dwindles as Plants Grow

ACCORDING TO J. D. Ross, superintendent of Seattle's city light department, as quoted last week, that city will not have a power shortage this winter or for ten years to come. The supply of water behind Diablo Dam will more than take care of its power needs.

Word comes from Tacoma also to the effect that Lake Cushman, where a second unit will soon be in operation, now has an adequate storage of water. Although Tacoma has signed a power supply agreement with the Puget Sound Power & Light Company, it is not anticipated that this agreement will be put in force.

Engineers of the British Columbia Electric Railway Company announce that there is no possibility of a repetition of the power shortage of 1929. Water in power reservoirs has maintained normal level this year, and the new hydro-electric plant at Ruskin will add approximately 30 per cent to peak-load capacity with a possible output of about 500,000 kw.-hr. a day.

▼

## Boston Edison to Sell Ranges at List, Installed

EFFECTIVE NOVEMBER 1, the Edison Electric Illuminating Company of Boston launched a policy of selling electric ranges of 5,000 watts rating and more, installed, at list price for residential customers occupying first floors within one service stretch (about 100 ft.) of the company's overhead lines. In cases where the cost exceeds that to run one section overhead the customer must pay the excess. An Edison representative's specifications for necessary wiring are submitted for bids to three established contractors in or near the municipality where the range is sold and the work is awarded to the lowest bidder, the company paying the contractor. Plans are being made to canvass about 50,000 residential customers.

## Southeastern P. & L. Examination Next Week

ANNOUNCEMENT COMES from the Federal Trade Commission that hearings in the utility investigation will be resumed on Monday, November 10, when the financial structure of the former Southeastern Power & Light Company will be examined.

In an interim report to the Senate the commission says that the fire on August 30 "destroyed the reports which commission examiners had prepared for public hearings relating to eight companies, as to which hearings had not been held up to that date, destroyed some or all of the field analysis sheets, together with many prepared exhibits pertaining to four other companies, and also the exhibits prepared by commission accountants to accompany the report on a thirteenth company." The names of the thirteen companies alluded to were not made public.

▼

## Three-Cent Energy Rate for Hartford Homes

BEGINNING NOVEMBER 1, the Hartford Electric Light Company established an energy rate of 3 cents per kilowatt-hour for partial domestic use after the payment of 4 cents for the first 2 kw.-hr. per 100 sq.ft. of billing area per month plus a flat rate of 8 cents per month per 100 sq.ft. The former increment rate was 4 cents per kilowatt-hour. This voluntary reduction will amount to about $100,000 per year, but in announcing it President Samuel Ferguson stated that the most important feature of the change is that it makes additional electricity available for all purposes at every socket in Hartford homes at the 3-cent rate, and that this new price makes complete use of electricity reasonable for all sizes of residences.

▼

## N. Y. Edison Officials Complete Rate Testimony

PRESENTATION OF EVIDENCE by the New York Edison and the affiliated companies in Greater New York was concluded on October 31 at the rate hearing before the state commission. William L. Ransom, counsel for the companies, announced that, except for a few details to be supplied to representatives of consumers, he would present no other data.

The hearing will be resumed on November 12, when Clarence J. Shearn of the Real Estate Board and other opponents of the proposed rates will present evidence.

## Wisconsin County Claims Rural-Service Banner

MARATHON COUNTY, WIS., has a greater mileage of rural electrification for farm use than any other county in the United States, according to W. J. Rogan, Marathon County agent. There are 376 miles of electric power lines in the county and 30 per cent of the farms in the county are making use of electric power. "This situation has been brought about in the last five years," says Mr. Rogan. "Up to that time there were only 77 rural customers. It is not too much to expect that the farms not using electric power at the end of five years will be comparatively few."

▼

## Rural Service Expands in Great Lake States

RURAL ELECTRIFICATION in Indiana, Illinois, Michigan and Wisconsin has increased five and a half times since 1924, representatives of electric power companies were told at the opening of the fourth annual conference on rural electrification at Purdue University. This fact was stated by E. F. Kelley of Springfield, Ill., who is chairman of the rural service committee, Great Lakes Division of the National Electric Light Association. Dean J. H. Skinner of Purdue discussed rural electrification in Indiana. Other speakers included A. V. Krewatch, who is connected with the national rural electrification project; Prof. F. W. Duffee of the University of Wisconsin, W. J. Parvis, Indiana Electric Light Association, and Prof. J. H. Hilton of the Purdue dairy department.

▼

## Rural Service Gains Greatly in Alabama

RAPID ADOPTION of electric service by the farmers of Alabama whose premises are reached by the lines of the Alabama Power Company is shown by an analysis just made by the chief agricultural engineer of that company, E. C. Easter. This shows that 100 farmers in that state used 1,000,000 kw.-hr. in 1929, dairies coming first, with 51 farms using an average of 14,240 kw.-hr.; general farms next, with 41 farms using an average of 6,414 kw.-hr., and three poultry farms, three truck farms, one pecan farm and one nursery showing a consumption of from 4,000 kw.-hr. to 5,000 kw.-hr.

▼

## Some Farmers Spend $40 Monthly for Electricity

WITH 70,000 FARMERS adding themselves to the list of power users in the first seven months of 1930, light and power companies can look for expansion in rural territories large and fast enough to justify plenty of study and expenditure, George W. Kable, director of research for the Committee on the Relation of Electricity to Agriculture, told the American Society of Agricultural Engineers at its annual convention in Rochester, N. Y., recently. Many farmers who once objected to a monthly lighting bill of $1.50 now are cheerfully spending from $30 to $40 a month for energy, Mr. Kable said, adding:

"The ultimate goal of farm electrification is not motors and meters, but good sound engineering analysis and management proved by the annual net income. This problem, in my opinion, should occupy first place in farm studies."

▼

## Mississsippi Charter for Transmission Company

INCORPORATION IN MISSISSIPPI of what appears to be designed in part as a competitor of the Mississippi Power & Light Company and the Mississippi Power Company has aroused interest in that state. This is the Mississippi Transmission Corporation, empowered to distribute electricity and natural gas in Mississippi and other Southern states. John B. Mallers of Chicago is president and L. B. Howard of Nashville and W. H. Wilkes of St. Louis vice-presidents. Capitalization of the new company or the source of its contemplated power supply is not set forth, but 25,000 shares of common stock are to be issued, their valuation to be fixed by the directors.

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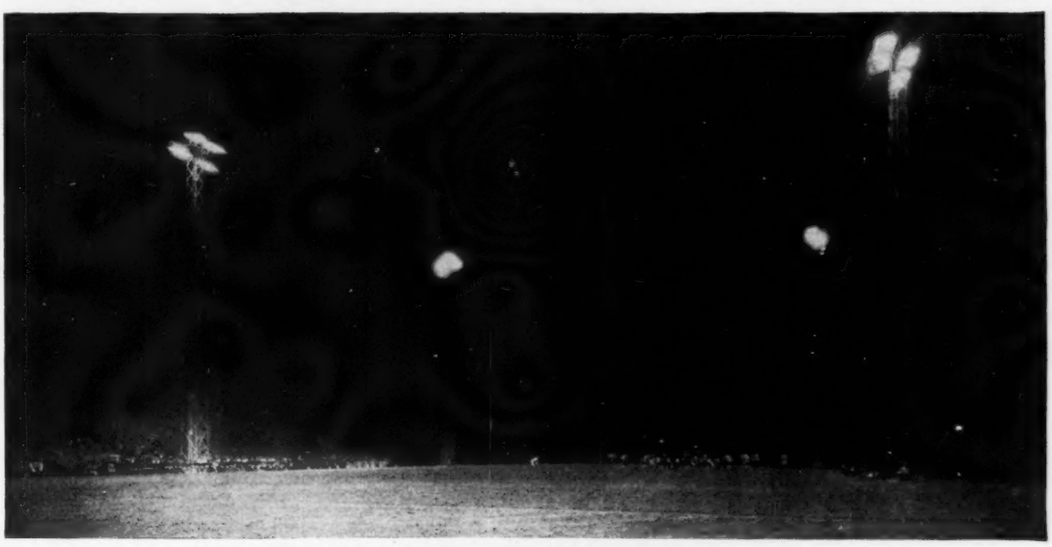
## TWENTY THOUSAND SEE FOOTBALL GAME UNDER 320 KW. OF LIGHT



*The football field of the University of Detroit is lighted to an extremely high uniform intensity by 160 1,000-watt and 16 10,000-watt lamps in specially designed reflectors mounted on six 100-ft. towers. Two games that would not have drawn 5,000 people on Saturday afternoon averaged 16,000 on Friday night. Another that might have attracted 10,000 in the daytime brought out over 20,000 at night.*

## Louisville Meeting of A.I.E.E. Promises Well

INDUSTRIAL POWER APPLICATIONS, transportation and electrolysis, transmission and distribution, and protective devices, with selected subjects in other classifications, will provide topics for 20 papers to be presented at six sessions when the Southern District of the American Institute of Electrical Engineers meets at Louisville on November 19 to 21 inclusive. E. L. Moreland will tell about the Lackawanna electrification; J. E. Housley will describe the lightning investigation at Alcoa, Tenn.; R. M. Stanley will give a paper on the Ohio Falls hydro-electric station, and M. E. Lake one on the Duke Power Company's steam stations.

Electric power in the cement, lumber and rubber industries respectively will be the theme of three contributions, and General Electric, Westinghouse and other engineers will deal with technical developments, including arc welding, while reactance-type distance relays and reduction of transformer noise will be discussed by E. E. George and R. B. George respectively. Four engineers unite in a paper on governor performance during system disturbances. A dinner-dance and other social features are to be provided.

▼

## British Columbia's Big Plants in Various Stages

THE FIRST GENERATING UNIT of the British Columbia Electric Railway Company's new hydro-electric plant at Ruskin, B. C., was turned over for the first time a few weeks ago, following the closing of the dam and filling up of the storage basin, and the new 47,000-hp. machine will soon go into commercial operation. The two 66,000-volt transmission lines which will take the Ruskin power to Burnaby substation have been tied in at both places, and the work of enlarging the substation at Burnaby is being rushed to completion.

Activity at the Bridge River hydro-electric development of the company is now centered on lining the 2½-mile tunnel with concrete. It is expected that this task will be completed next summer, when work will begin on the dam behind which enough water will be stored to develop 216,000 hp.

The power scheme of the Powell River Company at Lois River, B. C., is making rapid progress. The temporary log crib dam has been completed and the penstocks have been laid. The 5,800-ft. tunnel is also completed, and the work of lining the tunnel is about to commence. The transmission line from Lois River to Powell River has been finished for several months, and erection of the power plant at Stillwater is under way.

The West Kootenay Power & Light Company will harness the hydro-electric power of the Pend Oreille River in British Columbia with a dam nearly 400 ft. high. This scheme, which was dropped for a time in favor of a two-dam development, has been finally adopted. The power company's dam will be constructed near where the Pend Oreille empties into the Columbia. It will impound the entire flow of the river back to the international boundary. The output will be about 300,000 hp., a large part of which will be used by the Consolidated Mining & Smelting Company for its new fertilizer plant at Trail. The West Kootenay company also contemplates a power development scheme at Coraline, on the Kootenay River, to produce 30,000 hp.

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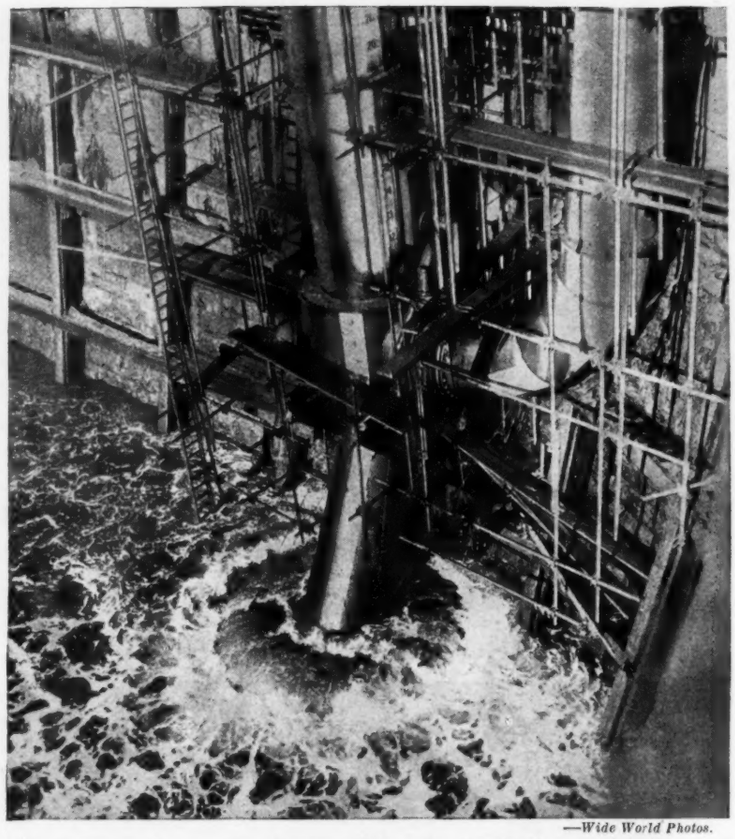
## TIDAL POWER HARNESSED IN ENGLAND



—*Wide World Photos.*

*At Avonmouth, on the Severn River in England, an experimental tidal-power plant has recently been demonstrated. The photograph was taken at low tide.*

▼ ▼ ▼

## Severn Barrage Project Declared Practicable

LONG THE SUBJECT OF DISCUSSION, the tidal power project on the Severn Estuary in England is again attracting notice in technical circles. Manchester University Engineering College has constructed a scale model of the estuary for the study of the problems involved, and it is stated that the experiments with this model have put beyond dispute the practicability from an engineering standpoint of this scheme to generate power.

It remains to be determined whether generation of electricity by tidal power and its distribution to consumers at distant points will be an economic success as compared with generation by steam at large power stations. Opinion in south Wales is still largely against the plan because of the possible effect in increasing silting. This might prove serious to the existing ports, where the dredging of obstructive sandbanks is already costly.

## Agreement Reached Over Algoma District Sites

FULL RIGHTS TO POWER SITES on the Missassagi River, in northwestern Ontario, capable of producing 150,000 hp., have been acquired by the Ontario Hydro-Electric Power Commission from the Algoma Central Railway and the Algoma District Power Company. Development of the Montreal River sites, both upper and lower, over which there has been an ownership controversy of long standing, will be undertaken, according to the agreement, by the Algoma interests, subject to government supervision.

▼

## Alabama Sues Company for Tax on Power Exported

THE STATE OF ALABAMA has filed a suit against the Alabama Power Company to collect a privilege tax of two-fifths of a mill per kilowatt-hour for all hydro-electric power exported out of the state during the year 1929. The power company, the state alleges, during 1929 manufactured and sold 1,456,341,776 kw.-hr. of hydro-electric energy; on October 1, 1930, it paid to the state $345,741, and there is still due a balance of $236,822 plus interest.

The amount paid by the power company, it is asserted, was on 864,285,573 kw.-hr., or the hydro energy manufactured in Alabama and sold within the state. The rest of the hydro energy produced was exported, chiefly to Georgia and the Carolinas, during the drought. The power company has declined to pay a privilege tax on power sent into other states.

▼

## Coming Meetings

**National Electrical Wholesalers' Association**—Pittsburgh, Nov. 10-14. E. Donald Tolles, 165 Broadway, New York.

**National Association of Railroad and Utilities Commissioners**—Charleston, S. C., Nov. 12-15. J. B. Walker, 270 Madison Ave., New York.

**Public Utilities Association of Virginia**—Virginia Beach, Nov. 13 and 14. C. O. Robertson, Roanoke.

**American Institute of Electrical Engineers** — Southern District, Louisville, Nov. 19-22; winter convention, New York, Jan. 26-30. F. L. Hutchinson, 33 W. 39th St., New York.

**American Society of Mechanical Engineers**—New York, Dec. 1-5. C. W. Rice, 29 W. 39th St., New York.

**Pacific Coast Electrical Association**—Engineering Section, Los Angeles, Dec. 10-12. S. H. Taylor, 447 Sutter St., San Francisco.

**American Engineering Council**—Annual meeting, Washington, D. C., Jan. 15-17. L. W. Wallace, 26 Jackson Place, Washington.

**North Central Division, N.E.L.A.**—Commercial meeting, Nicollet Hotel, Minneapolis, Jan. 26 and 27; engineering meeting, same place, Feb. 23 and 24. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

**Midwest Power Engineering Conference** — Chicago, Feb. 10-13. G. E. Pfisterer, 308 W. Washington St., Chicago.

## Charleston Topics: Regulation and Rate Making

FEDERAL VERSUS STATE REGULATION of utilities, government and municipal operation and other subjects will be discussed at the forty-second annual convention of the National Association of Railroad and Utilities Commissioners, to be held at Charleston, S. C., November 12-15. Charles Webster, member of the Board of Railroad Commissioners of Iowa, will deliver the presidential address, and there will also be addresses by Senators Cole Blease and Ellison D. Smith of South Carolina.

"The Natural-Gas Problem" will be discussed at an evening session by Alexander Forward, managing director of the American Gas Association; "Federal or State Regulation?" will be the subject of an address by William Chamberlain, president of the United Light & Power Company of Chicago, and the chairman of the Indiana Public Service Commission, J. W. McCardle, will speak on "Government and Municipal Operation of Utilities and Other Properties." William A. Prendergast, former chairman of the New York Public Service Commission, will make an address on "Principles Verses Opportunism in Rate Making," and Charles H. English, chairman of the Board of Law Examiners of Pennsylvania, will discuss "The Lawyer in Regulation."

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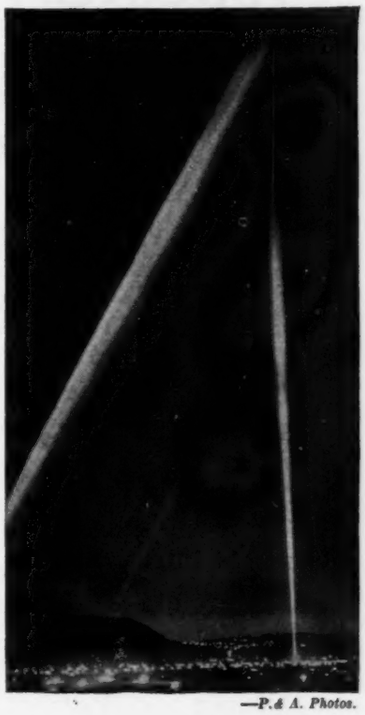
## Seattle Pays More for Dam, Authorizes Office Building

AN ADDITIONAL $500,000 has been granted by the utilities and finance committees of the Seattle City Council, as requested by City Engineer R. H. Thomson, to complete payment for Diablo Dam. With the $500,000 in bonds that was recently granted, the cost of the dam is thus increased $1,000,000 over the original estimate of $3,500,000.

A lease between the city of Seattle and the City Light Building Company has been filed permitting the company to construct a 25-story tower-type fireproof store and office building on city-owned property on Third Avenue, between Madison and Spring Streets, to cost $1,750,000. The building will become the property of the city at the end of 50 years.

## ARMY SEARCHLIGHTS REVEAL PLANES



—P. & A. Photos.

*Two of the U. S. Coast Artillery's 8,000,000,000-cp. fingers of light attempting to place an "attacking" bomber in night maneuvers over Los Angeles.*

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## Historic Concord Becomes an Edison Customer

WITH THE THROWING OF A SWITCH in the new Concord substation about noon on Monday by Chairman Robert Bowser of the municipal lighting board, the famous old Massachusetts town became a wholesale customer of the Edison Electric Illuminating Company of Boston. A distinguished gathering of municipal officials and utility men attended the inauguration of service, and the transfer of load from the old municipal steam plant to the Edison system was accomplished without a hitch.

Two 13.8-kv. underground cables have been laid from the new Woburn substation of the Edison company through Lexington to Concord, and from this point customers in the towns of Maynard, Acton, Carlisle, Lincoln and Sudbury will be directly served. The Concord installation is of the automatic type and at present has 10,500 kva. in transformer capacity installed in two three-phase units, one being held as a spare. The company will buy the Concord plant and distribution system for $600,000 if the town consents within two years.

# PITTSBURGH'S NEW STATION

*Pittsburgh Aerial Surveys*

## A Study in Reliability and Economy

**Notable for the engineering design which had as its objective reliable service, safety and operating economy, and for the construction practices which produced it, the James H. Reed station of Duquesne Light Company went in service on October 16. Features include: Circulating water pumps at river, 700 ft. from station, tunneling eliminated; no deaërators used; house generator omitted; duplicate auxiliary equipment minimized by grouping feeders; insulated fault ground bus, and 200-ton freight car elevator to connect plant tracks with railroad trestle.**

# EDITORIALS

L.W.W.MORROW
*Editor*

## Mark Twain and rates

MARK TWAIN once said that folks talk a lot about the weather but no one seems to do anything about it. But why should they when there are few spots in our temperate zone where people do not live and enjoy it? Even if something were done, it would be hard to accommodate equally those who run farms, dry foods, promote sports and operate hydro plants.

There is somewhat less humor in the public's subdued wonder why some one does not do something about the apparent complexity in electric billing. It seems not to be realized that the reasons why electric rates are not so simple as commodity prices are nearly as potent as those that prevent control and precise prediction of the weather. The data are available or ascertainable in both cases, but in neither are the phenomena reducible to linear simplicity.

Those who long for simplicity should contemplate these questions: Shall the legitimate return be earned on the operations or on the investment? Must adherence to the cost-of-service principle exclude all considerations of value of service, ability to pay or cost of competitive services? Should the capacity charge be predicated on what the consumer does use or on what he may use? Is new business commendable even if the old business postpones its participation in the ultimate over-all economies of expanded operations? What rate will conserve the best interests of all if a new development comes across the horizon to disarrange the present balance of industrial, commercial and household usage—for the electrical industry has no divine assurance that it may not at any time encounter the same disruptions that have flustered the motion-picture, gas, railroad and street-railway industries so recently.

Rate theory embraces all these elements, and together they make a complex. In billing practice there is far less complexity than in the determination and allocation of the proportionate revenue. In fact, there are plenty of billing formulas that are as simple as they can be made with impunity. Half the country is buying its electric service under charging schemes that are as rudimentary as anything but pure commodity transactions could be. Others are still too complex. Still others are too simple to induce the increased use which alone has been the justification for the steady rate reductions by which the consuming public has benefited. The moderate degree of complexity reflected by the happy medium is certain to be a continuing aspect of the rate to which the average will gravitate.

## Capitalizing the depression

EARNINGS and output figures on some power and light companies are still moving upward in utter disregard of their expected behavior in a depression. Executives of a number of companies whose figures thus violate all business proprieties were approached for an explanation. Their answers are suggestive.

In most of these cases anticipated declines were used as the incentive to spur the sales departments into intensified activities. These companies took the remarkable attitude of ignoring the orthodox business procedure of resting on their oars because a state of depression was declared to exist. Most of them knew they faced a decline in industrial load. They decided to speed up domestic sales to take care of this loss, both anticipated and actual. How? One in particular introduced inducement rates in several situations and actually

recorded a substantial rise in per capita domestic consumption. Several other companies built up their load by expanding appliance sales through intensive drives. In at least two cases the volume of merchandise sales reached a point far above any previous record on their books.

These companies are actually capitalizing the depression. Further, additional business placed on their lines at this time puts them in a strong position to take advantage of better conditions when they arrive. Their gratifying showing did not just happen. It was organized. Their record cannot be duplicated by all companies, but it illustrates the possibilities.

## Ice and water power

WATER has a habit of freezing when its temperature falls to 32 degrees Fahrenheit. The effort to effect this physical transformation makes the phenomenon a peculiarly attractive one from the electrical load standpoint, both domestic and commercial. But when nature engages in the enterprise around hydro plants it is far less joyful —the habit might even be called pernicious. The hydro plants have found no royal solution to the problem of keeping the gates, racks, channels and surge tanks free of ice. Heat and mechanical agitation, separately or in combination, have proved effective in varying degree under the inevitable variation in local conditions. The striking thing, however, is that, even where equally effective, there is a wide range in the values of energy devoted to ice prevention.

The high-head plant seems to be less vulnerable than the low-head plant. The amount of heat expended to keep racks clear of ice in one instance represents roughly the equivalent loss of one per cent of the (high) head and only an average rise of one-five-hundred-and-fortieth of a degree Fahrenheit in the total volume of water passed through the turbines. But in a low-head plant the volume of water is relatively so great as to preclude the resort to heat; instead, 10 to 15 per cent of the water volume is often wasted in flushing the ice clear. A recent report of the N.E.L.A. hydraulic power committee sets up such experiences and deductions in an excellent analysis of the multifarious schemes being used to combat ice.

The temperatures, the configuration of hydro works, the flow, the load on the station provide an endless number of combinations of the variables. But fundamentally water is water and energy is energy. It seems as if some hydrodynamic engineer with thermodynamic proclivities, or vice versa, might look upon this overlap of these two fields as a fertile one for fundamental research. Out of a searching analysis of the factors and their variations would surely come an effective solution that would have wide applicability and more uniform efficiency percentages. That has been the experience with every other investigation that supplanted local improvisations and went to the seat of the difficulty. There is just as much reason to believe that a thorough analysis of all the terms and exponents would produce a simpler answer in this case than anyone has yet obtained.

## Power-factor correction for neon signs

AFTER more than two years of investigation and negotiation, power companies serving Portland, Ore., succeeded in reaching an agreement with manufacturers of neon signs by which, beginning September 1 last, only signs equipped for power-factor correction were to be installed. Tests on a large number of signs had shown the power factor of the average neon sign to be in the neighborhood of 40 per cent; also, that while the sign load was small comparatively and low power factor had little effect on the system as a whole, nevertheless, the effect upon the underground distribution system serving a majority of the signs was quite noticeable.

Manufacturers will use one of two means of bringing about the desired correction. Some will place capacitors or static condensers of proper capacity across the transformer terminals, while others will use a transformer with a condenser built in as an integral part of it. Either method will raise the power factor of the sign to approximately 90 per cent. This will increase the cost of the transformer about 15 per cent, it is stated, but since the transformer installation usually does not exceed 10 per cent of the cost of the sign, no great

burden will be imposed upon either the manufacturer or the customer.

What the Portland companies have been able to accomplish in the territory they serve is a precedent for consummating similar agreements elsewhere. All electrical devices that serve a purpose can be made commercial enterprises for all electrical interests.

## Water-heating economics analyzed

A DISTINCT contribution to industry thought on the economics of domestic electric water heating is made by L. L. Elden in this issue through a straightforward analysis of the comparative costs of on-peak and off-peak service under conditions typical of New England utility operation. There is little doubt that the chief obstacle to the rapid development of water heating is the absence of a complete and practical understanding of the limitations, potential market and most effective and economic methods of application of this fine class of service.

The clarity of the author's method of attack and, indeed, its simplicity in the face of modern variations in distribution system layouts deserve much praise. Analyzing system load curves as the ultimate arbiters of feasible off-peak business development, Mr. Elden proceeds to show that for particular assumed conditions off-peak, low-wattage heating can be done at a profit at a rate of 1 cent per kilowatt-hour and that on-peak service under the same conditions leads to serious loss. The difference worked out by the author is so striking that perhaps the chief lesson of the paper is the importance of setting to work immediately to establish policies in water-heating development based on the most thorough economic investigations possible over a wide range of conditions, in order that every forward step taken may be in line with the prosperity of the operating company concerned and in accord with the needs of the customers.

Fortunately, the equipment now available is such as to afford highly flexible treatment of the water-heating problem in different systems and localities. From the utility standpoint the growing interest in off-peak heating, especially at night, appears well warranted; but engineering opinion in the industry is by no means uniform as to the limitations of present methods and the effect of diversity on costs and profits. There is no question that the utilization of idle capacity on off-peak service deserves more active encouragement by power companies and increased attention by sales departments. On the other hand, it is important that the costs, profits and losses of on-peak water heating be more carefully determined and that policies be formulated on the strength of such analyses and from wider field experience. Service coverage in this field must be sufficient to overcome the effect of many variables, and analyses like Mr. Elden's offer the industry valuable aid in its attack on the alluring problem of how to develop this important business.

## Reciprocal buying under fire

RECIPROCAL buying is under fire by the Interstate Commerce Commission, with particular reference to railroad traffic and purchases. Increased pressure of competition and the present low stage of business appear to have brought about a revival of this old question and a renewal of practices often condemned in all industries.

In the endeavor to reach the maximum economy in production and sales the electrical industry has tried to eliminate the abuses of "you favor me and I will favor you" business conduct. By such conduct favoritism is developed, competition is stifled, initiative is discouraged, and the sense of right and wrong is dulled. Instead of contributing to business recovery, these abuses place stumbling blocks in the way of recovery.

It is difficult to draw the line between friendship and business, but some things are clear. Friends should not receive business even though their prices are higher; friends should not be given opportunity to meet a low bid without the low bidder being notified; friends should not always receive all the business if this leads to the stifling of competition. Merit buying of meritorious products is the only safe practice to follow both for reasons of economy and for the development of sound business practices. Friendship and reciprocity have a legitimate place in industry, but this fact should not lead to abuses.

# Achievements Vindicate the Holding Company*

By MARTIN J. INSULL

*President Middle West Utilities Company*

IN THE early days of the electrical industry its service was largely confined to lighting. There were organized innumerable small corporations with barely enough capital to provide the necessary plant and distribution system for lighting the communities in which they were situated. Their financial structures were generally too weak to secure the new capital necessary to meet the ordinary growth of the business.

As the industry developed and electricity was demanded for power as well as lighting, these companies were physically, financially and organically unable to meet the public's demand for service. They largely continued only as lighting companies, many of them running only from dusk to dawn, and then often only intermittently.

Meanwhile, the companies serving the larger metropolitan centers, being better organized physically and financially, were able to keep pace with the development and demands upon the industry. The result was a corresponding difference in the industrial progress of the metropolitan areas as compared to the smaller communities.

In recognition of these conditions, an experiment was tried in Lake County, Illinois, in 1910. Practically all the inefficient small-town plants in the county were shut down. The towns were joined by an interconnected system of transmission lines and served by a larger and more economical generating station, capable of supplying electric energy twenty-four hours per day for all the homes, farms and industries in the county. This experiment demonstrated that while such a system required an increased capital investment, it resulted in decreased operating expenses, and therefore reduced rates, larger gross earnings and a fair return on the capital invested.

The development of the electric light and power industry as we know it today followed. The early years after 1910 saw men of vision, courage and credit resources gathering together small groups of contiguous, inefficient, poorly built and poorly financed light and power plants into single operating units interconnected as were the Lake County plants and fed from comparatively large, modern, efficient generating stations. With their own resources or by the use of their credit they were enabled to finance one, possibly two or even three such groups. From the investing public they secured part of the money through the sale of bonds and preferred stock, but the equity or common stock money of these operating companies they had to supply themselves. As the business of these companies grew, more and more money had to be raised for necessary service facilities.

### Additional equity money

To continue marketing bonds and preferred stock, proportionate amounts of additional equity money had to be supplied by these pioneers of this second stage of the electrical industry. Soon their personal resources were used up. They stretched their credit to its elastic limit, but still the operating companies they had put together required more and more money. During the period of using up their personal resources and credit they had acquired a large part of the common stock, possibly some of the preferred stock and maybe a few bonds of the various operating companies they had formed. These equities they had pledged in reaching the elastic limit of their credit and they found themselves breaking under a financial overload. They had to find ways of using them to pay their debts and create a financial vehicle through which they could use further equities for raising more money.

Looking back, it is apparent to us today that the plan adopted by our pioneers to carry on was very much to the credit of their foresight. They simply adopted the

**From address at opening of new 50,000-kw. station of Jersey Central Power & Light Company, South Amboy, N. J.*

"holding company" form of corporate organization. The "holding company" was not a new thing in American business. It had appeared in various forms before electric light and power had ever been seriously considered as a commercial possibility. Such equities as these pioneers had they turned into the treasuries of their newly formed holding investment companies, and issued debentures and preferred and common stocks of the holding companies against them. The debentures and preferred stocks, in many cases carrying a bonus of common stock, were sold to the investing public, the proceeds being used to provide needed money for the operating companies and partially to reimburse the organizers, whose equities in the operating companies were now represented by cash and common stock of the holding company.

Under this leadership the industry grew, until today it represents an investment of $11,000,000,000. This large investment has been made by the saving and thrifty millions who believe in the electric power industry and in its management. Nine billion dollars of this has been invested since the Lake County experiment and the consequent development of the electric light and power holding or investment company.

### Real interest in rates

The real public interest in the rate is whether it is a reasonable rate and whether it is high enough to insure for the operating company the earnings necessary to enable the company to secure from the investor all the new money necessary to supply the facilities to meet all the demands of the public for service.

The financial structure of an operating company in its simplest form consists of bonds, preferred stock and common stock. The interest on the bonds and the dividend rate on the preferred stock are generally lower than the rate of return on the value of the physical property allowed by the regulating commissions. This results in the possible dividends on common stock being at a rate theoretically and sometimes actually higher. This has been the subject of adverse comment notwithstanding that

**the rate of return on common stocks must necessarily be high to attract investors—be they individuals or holding investment companies—to this equity security, the principal and dividend return on which is the least sure.**

Who pays the common-stock holder this increased return? Not the consumer. The rates paid by the consumer continue to provide only the return allowed by the commission on the property investment. What really happens is that the common-stock holder is, in effect, being compensated by the bondholder and preferred-stock holder for taking the risk off their investments.

In other words, the return allowed by the regulatory bodies has been redistributed among the various security holders according to the varying degrees of risk incurred. This transaction is completely divorced from the question of the earnings of the property as a whole. In effect, the investor making the high return has made a trade with the one receiving the low. It is thus possible to attract capital to the common stock, which thereby takes the maximum risk and which would hardly be attracted by the return allowed by the commission.

This common-stock holder, in the case of a great many operating companies, is a public utility holding investment company. It is thus an instrument designed to absorb the risk involved in the financing of operating companies, and then to spread and diminish this risk.

In contrast to the differentiation of securities discussed, let us assume an attempt to finance an operating company entirely through the issuance of one class of stock. This stock would theoretically earn the same rate of return as that allowed by the regulating commission. This, however, if paid out to the stockholders, would leave nothing for reserves, contingencies, etc. Stable corporations cannot exist without these because they very largely form the margin between dividends paid and the corporation's earnings which the investor requires to attract him to the security.

The fact that holding companies generally own the common stocks—in other words, have absorbed the risks —of operating utility companies has proved to be one of the most favorable circumstances in the development of public utility service. No element is more important to the progress of the industry than the character of the common-stock ownership. The attitude and policy of the holders of the operating companies' common stock determines whether the operating company shall pursue a progressive course or, as far as it is able, a standstill and "let-well-enough-alone" policy.

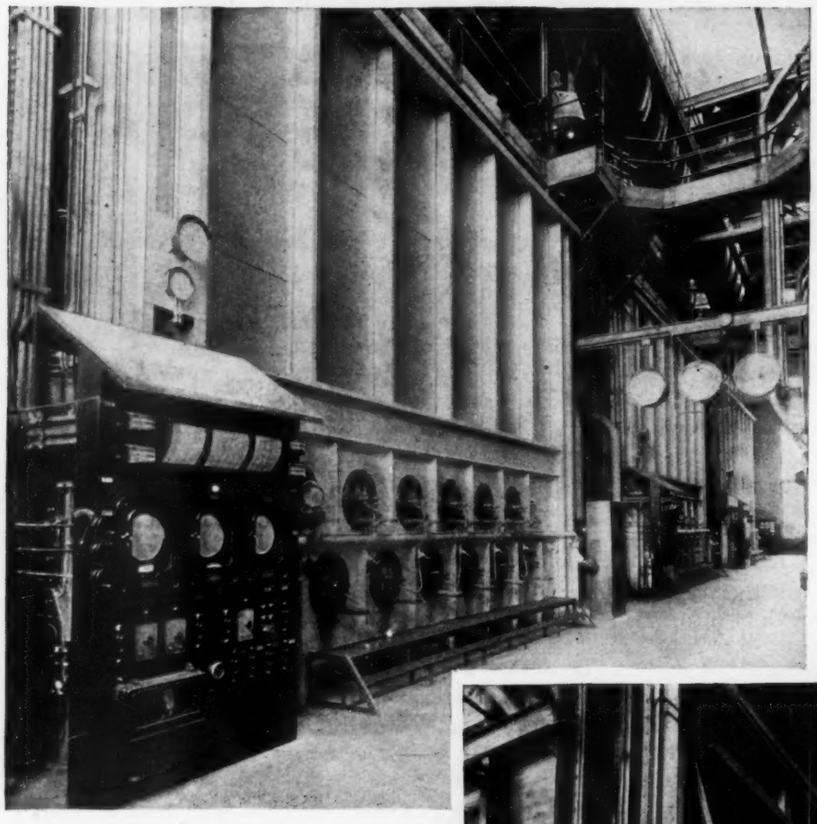
**The continuing progress of the industry in national electrification is largely due to the ownership of the common stock of operating companies by these holding investment organizations.**

These are trained and experienced in the utility business, organizations which can take risks because of their diversified investments and their experience in having met similar conditions before; which know the objectives and the method of realizing them.

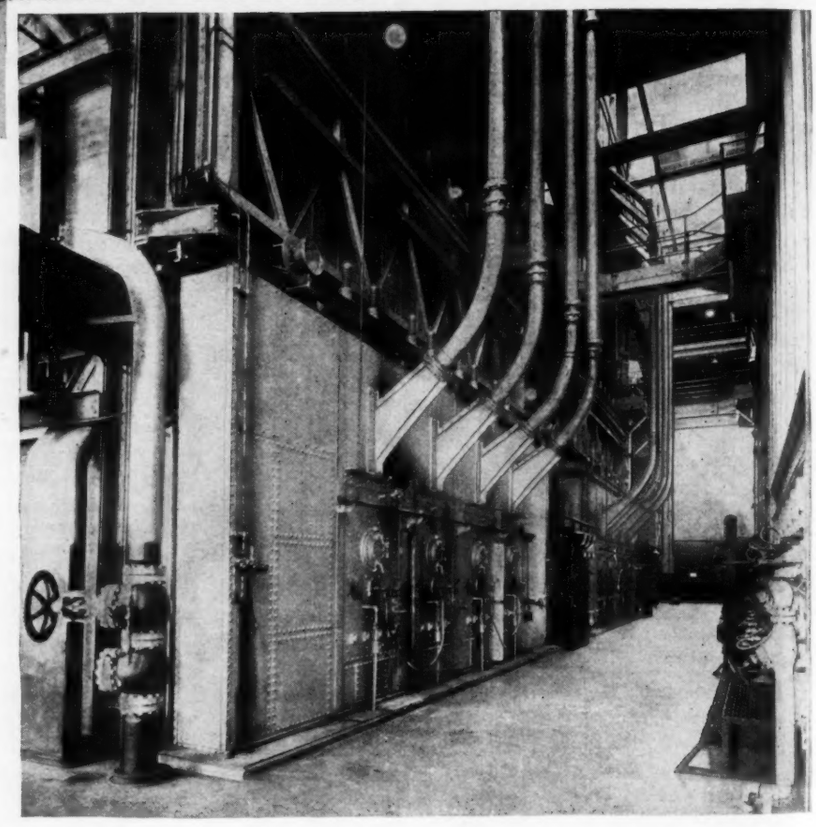
There has been criticism of the pyramiding of holding companies. Even if this really exists in the form imagined, which is questionable, it can have no effect upon the consuming public. Its effect, if any, would be on the investing public, in that the securities of each superimposed holding company would be farther and farther away from the actual asset value that they represented. There are cases of what might be termed super-holding companies, whose subsidiaries may include both operating companies and holding companies with operating subsidiaries of their own. These have come about by the purchase of one holding investment company by another, or through the formation by existing holding companies of subsidiary holding companies to supervise the operation of a group of operating companies located far from its own headquarters. This would only happen in very large systems, which in the aggregate have enormous amounts of new equity capital to raise each year. For them it has the advantage of giving them several vehicles through which to finance.

These large systems need these vehicles through which to provide equity capital for thousands of small towns tied together by transmission lines, and it is very doubtful if the development of the past twenty years that has brought the benefits of electrical energy to towns, hamlets and countryside could have taken place had it not been for the holding investment companies of the electric power industry.

# Boiler Plant Designed for Multiple Fuel Service



Original boiler group can be changed from fuel oil to pulverized coal in a fortnight with but one unit out of service at a time

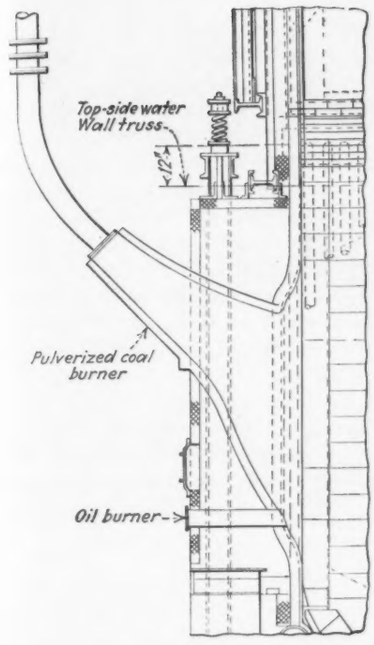


Oil and pulverized coal are burned simultaneously with good results in these newer boilers

PULVERIZED coal and fuel oil are economically burned at the Somerset station of the Montaup Electric Company, near Fall River, Mass., according to prevailing market conditions. The relation of the boiler-plant design to changing conditions in the fuel market is interesting. The present installation consists of five 1,493-hp. Stirling boilers equipped with superheaters, economizers and air preheaters. Steam is generated at 400 lb. per square inch pressure, 725 deg. F. temperature.

Boilers Nos. 1, 3 and 5 were installed in 1924 and are equipped with air-cooled refractory furnaces, while the furnaces for boilers Nos. 2 and 4, erected in 1927, are of water-wall construction. All five boilers are arranged for burning either fuel oil or pulverized coal.

The initial three-boiler installation was designed and equipped for fuel-oil burning on account of the favorable price of oil which prevailed during the period of design and construction. Provision was made in the general arrangement of the plant, however, for a future change to pulverized-coal firing in order to take full advantage of any change in the relative market price of the two fuels. Operating costs with liquid fuel remained favorable until 1926, but from then through 1927 oil increased greatly in price while coal steadily decreased, until the market situation existing




**Entrance of oil and coal burners into furnace of new boiler**

prior to 1926 was entirely reversed. Coincident with the relative change in the price of fuels, it was necessary in 1928 to provide additional generating capacity, and it was therefore decided to erect two new boilers, which are identified as No. 2 and No. 4, with pulverized - coal equipment and to change the three existing steam-generating units from fuel oil to coal burning. As mentioned above, the furnaces of boilers Nos. 1, 3 and 5 were originally designed for a possible change from fuel oil to pulverized coal, and the alterations in furnace design, therefore, involved a relatively small amount of reconstruction. The twelve Lodi oil burners installed in the front wall of each furnace were removed and the openings bricked up, the arch between the top of the front wall of the setting and the front steam drum being modified to accommodate eight Lopulco vertical pulverized-coal burners.

### Two weeks to shift fuels

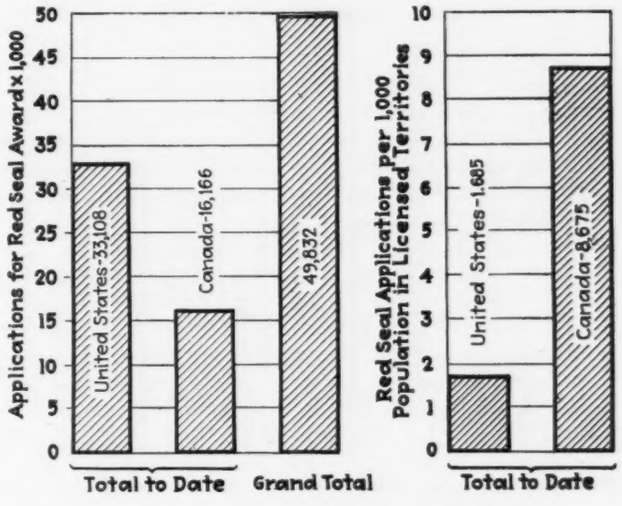
During the latter part of 1928, some time after the pulverized-coal system had been in successful operation, the relative price of fuel oil and coal again changed, making it desirable to reinstall the oil-burning system on boilers Nos. 1, 3 and 5. The change of these three boilers from fuel oil to pulverized coal, or vice versa, can be made in about two weeks with only one boiler out of service at one time.

The new boilers, Nos. 2 and 4, which are equipped with water-wall furnaces, are provided with Calumet vertical intertube burners, requiring a special water-wall tube arrangement, and do not readily permit replacement of the coal burners with fuel-oil units. To take full advantage of the present low cost of oil, however, the four auxiliary fuel-oil burner tips which were originally used for coal-ignition service have been operated continuously. The burning of pulverized coal and fuel oil simultaneously in these furnaces has been entirely successful. The four oil burners have sufficient capacity to generate approximately 90,000 lb. of steam per hour, which is about 40 per cent of normal steam-generating capacity. Within the past few months a sufficient number of fuel-oil-burner barrels equipped with suitable tips have been added, and it is now possible to develop approximately normal steaming capacity with fuel oil. This plant was designed by the Stone & Webster Engineering Corporation, Boston.

# Canada Leads Relatively in Red Seal Applications

More than 33,000 Red Seal applications had been received up to October 1 in the United States, compared with more than 16,000 in Canada, but our friends across the border have 8.7 Red Seal homes per thousand population (in cities reporting), compared with 1.7 in this country. This seems to show a greater appreciation of adequately wired and fitted homes in Canada than here. These saturation figures are based on the populations of the cities in which Red Seal activities are carried on, about the same percentage of total population being involved in both cases.

Toronto, Canada, stands out with 12,429 applications to date, or 20.6 per thousand population. Washington, D. C., ranks next with 5,450, or 12.2 per thousand population. The standing of some other cities is shown in the table. Canadian cities have also maintained their efforts to increase Red Seal homes better than U. S. cities, this country's applications this year being only 58 per cent of the same period last year, whereas Canadian applications are practically the same as last year.




**High spots in Red Seal activities**

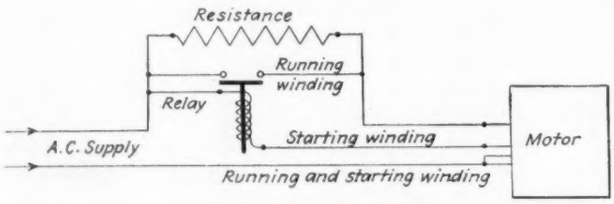
| | No. Applications Up to Oct. 1 | | Ratio Applications in 1930 to 1929 Up to Oct. 1 |
|---|---|---|---|
| | Total | Per 1,000 Population | |
| **United States** | 33,108 | 1.68 | 0.58 |
| Chicago | 3,094 | 1.00 | 0.29 |
| California | 6,607 | 2.64 | 0.59 |
| Pittsburgh | 2,068 | 1.42 | 1.10 |
| Chattanooga* | 434 | 6.00 | * |
| Denver | 528 | 1.95 | 1.35 |
| Kansas City | 1,088 | 2.35 | 0.76 |
| Louisville | 402 | 1.65 | 0.67 |
| Minneapolis | 766 | 1.95 | 0.62 |
| Philadelphia | 1,608 | 0.88 | 2.59 |
| Rochester | 1,317 | 3.47 | 1.29 |
| Tri-Cities | 218 | 1.57 | 0.47 |
| Washington, D. C | 5,450 | 12.2 | 0.24 |
| Youngstown, Ohio | 363 | 2.24 | 0.28 |
| **Canada** | 16,166 | 8.67 | 0.99 |
| Toronto | 12,429 | 20.6 | 1.01 |
| Windsor* | 552 | 5.52 | * |
| Vancouver | 2,131 | 5.00 | 1.11 |
| Winnipeg | 1,054 | 1.65 | 0.96 |

*September reports not received.

# Operating Split-Phase Motors at Reduced Speed

By A. B. HARRITT
*Maintenance Engineer*
*Des Moines Electric Light Company, Des Moines, Iowa*

It is often desirable to reduce the speed of a single-phase motor. This can be accomplished by inserting a resistance in the circuit, but the motor will not start and come up to running speed unless the resistance is cut out until the starting brushes have been thrown out




**Lowered-speed connection**

of contact. If the motor is manually started a switch can be provided to cut out the resistance until running speed is attained, but when it is automatically started an added attachment is necessary. At this point an adjustable, instantaneous, circuit-closing series relay comes into play.

Connect the proper resistance combination, the one giving the desired speed, in one side of the motor circuit and in series with the running winding only. Connect the coil of the relay with one side ahead of the resistance bank and in series with the starting brushes and starting winding. Connect the contacts of the relay across the resistance bank to shunt out the resistance when relay is closed. Use a relay that picks up at a low current value. The starting current is usually about 50 per cent more than the running current.

This scheme of connections was used on a $\frac{1}{4}$-hp. motor operating a blower on a gas-heating system and controlled by a thermostat. The layout functions as follows: The thermostat closes the motor circuit and the starting current energizes the relay, causing it to close its contacts and shunt out the resistance bank. This allows full voltage to be impressed across the terminals of the motor and it comes up to speed normally. When the speed becomes great enough to throw out the starting brushes the relay, having its coil in series with the brushes and starting winding, is de-energized and its contacts open. This leaves the resistance bank in series with the running winding and the motor operates at greatly reduced speed.

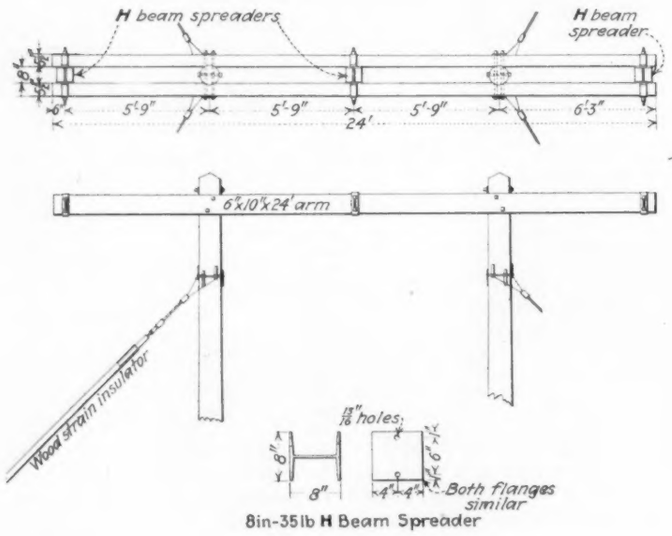
It is only necessary to keep the motor speed above the point where the starting brushes fall back into contact to obtain satisfactory automatic motor operation. The slightly reduced voltage at which the motor runs with the resistance inserted does not cause excessive heating.

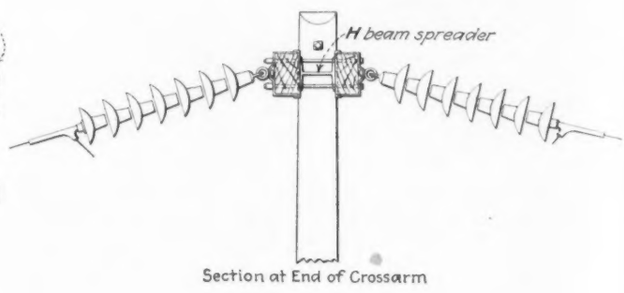
▼

# H-Beam Spacers Strengthen Strain Structures

Strain structures capable of withstanding an unbalanced pull of 30,000 lb. per conductor position have been obtained by the use of H-beam spreaders between the double arms on the Rock Island transmission line of the Puget Sound Power & Light Company. As shown by the accompanying drawings, three H-beam spreaders were used instead of the usual spacer bolts. The H-beam sections are doweled into the arms and the arms held together by two through-bolts. Thus, in effect, the two arms act as a beam, providing great strength and rigidity.

The line is the first section of a 110-kv. line between Beverly substation, near Everett, Wash., and the Rock Island hydro development on the Columbia River in central Washington. Stone & Webster Engineering Corporation is in charge of design and construction.




**Double arms with H-beam spreaders act as beam to withstand 30,000-lb. unbalanced pull**

# Economic Advantages of Off-Peak Water Heating*

By L. L. ELDEN

*Technical Adviser to the General Superintendent*
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THROUGHOUT the 50 years of the power industry's existence inability to secure an even distribution of load throughout each day and the need of meeting heavy daily and seasonal peak-load requirements have been major factors in the cost of service as rendered under prevailing schedules covering restricted use. Vast plant capacities capable of enormous output have been forced into partial idleness through all these years for want of a suitable outlet for the energy which might have been economically supplied during light-load periods.

Persistent efforts of utility companies through later years has greatly extended the use of electrical energy, with resulting improvement in system-load factors as distinguished from plant-load factors. System-load factors now average between 30 and 40 per cent, although values of 55 to 60 per cent have been realized under exceptional conditions. It follows that if suitable loads were available for delivery at the convenience of the utilities, system outputs might theoretically be increased 50 per cent or more, although an actual increase of 25 per cent more nearly represents the practical possibilities of off-peak loads under present conditions. Heat-storage systems as now developed offer a means to this end if properly operated on an off-peak basis, and if properly developed offer the greatest sales outlet for kilowatt-hours now in sight or in prospect.

### A golden opportunity has arrived

No argument should be necessary to show the profitable nature of such sales where incurred for the supply of hot water in residential service. Recognition of the minimum costs incurred for the production and distribution of off-peak energy and the small additional investment required only at the consumer's premises in connection therewith, coupled with the rates which may fairly be charged for the service, should be a complete answer to this broad question. However, the majority of our electric utilities have failed to enter this field in the past, and even now hesitate to grasp the opportunity before them to secure this business, as may be done even in the face of other well-known competitive methods.

This position is in part due to an inclination to avoid off-peak rates, fearing that future changes in living standards and business methods may so change the conditions of use as to make off-peak rates not feasible. Bearing in mind that the fundamental principle upon which off-peak rates should be based provides that the utility supplying the service should have absolute control of the hours of use, and giving further considera-

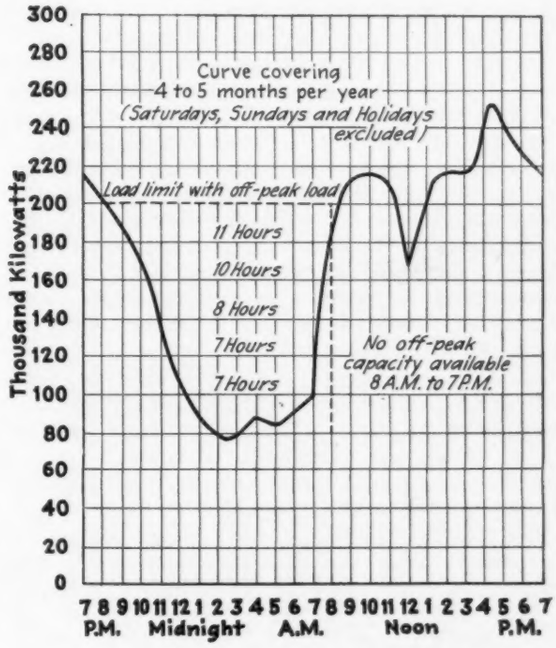



**Fig. 1—Typical winter load showing availability of off-peak power**

The economical off-peak load limit is 200,000 kw. because of forced operation of boilers above this line. Off-peak load limits cannot be based on values exceeding the system peak, since if this is done additional boiler plant investment will be required to insure economical operation and provide for adequate maintenance. In this situation 20,000 kw. of off-peak capacity may be supplied from 9 p.m. to 8 a.m., and additional capacity for shorter periods. With a given size tank a 1,500-watt unit will provide 55 gal. of 135-deg. water per day with an eleven-hour charging period. A 2,000-watt unit will supply 75 gal. If the 1,500-watt unit is used in connection with a range or house heater coil an adequate supply of hot water will be available within this charging period to exceed the demands of the average family. Without auxiliary heat, 2,000-watt units may be needed in some cases under the eleven-hour charging rate.

*From a paper before the New England Division of the National Electric Light Association.

tion to the fact that even modern living and business conditions have failed to develop any use of service which absorbs any material amount of available off-peak capacity, it should be apparent that hesitation to provide this service is unwarranted. If it could be assumed that the changing conditions thus feared could actually eventuate, the transition period must cover many years, during which time rate schedules would be revised to meet new conditions as they have been in the past.

Failure to secure such business must mean, in the end, a golden opportunity lost to increase materially earnings of existing plants with a minimum of additional investment.

Certain utilities have met this issue in part by authorizing off-peak rates available to large consumers under restrictions as to hours of use. Such service has been found particularly applicable to refrigeration and ice-making plants, various manufacturing processes, hotels, stores and office buildings during nights, Sundays, holidays and the non-heating season, and to other utilities during specified periods. As such business has unquestionably favorably affected utility costs in general, the interests of both consumer and utility have been advanced thereby. An extension of this class of service to residential and every other possible use, to the extent permissible, would appear to be sound business procedure in the interests of all concerned.

Since the service so supplied should be profitable under proper rates, the electrical industry should make every effort to fulfill its oft-repeated aim of "furnishing an all-inclusive service at all times," by at least providing rates which are applicable to all possible uses of the service throughout the year.

The accompanying diagrams are intended to direct attention to the operating conditions in various types of systems and plants serving New England communities.

Once established and furnished upon a satisfactory basis, the permanence of this form of service cannot be questioned. Age-old records show an ever-increasing use of hot water by civilized peoples. Under American standards of living, which are conceded to be the highest ever known, an adequate supply of hot water has become a prime necessity to meet everyday requirements. Its use increases with family growth, as well as with the normal increase in population, which automatically increases the number of domiciles or points of use. Further extension of its use in the home will follow the introduction of new labor-saving appliances, such as the electrically operated dishwasher, a device requiring substantial amounts of hot water for its operation. Industrial and commercial operations provide further opportunities to utilize hot water storage on a large scale; for example, garages, restaurants, hotels, laundries and many other undertakings are admirably adapted for the use of this service.

It should follow, therefore, that a safe, satisfactory and economical method of securing a desired hot water supply must naturally secure a substantial amount of this business if the service is made available under attractive conditions.

The fact remains that to insure a continuance of the remarkable rate of growth which the industry has experienced to date the efficiency and economies which can be secured through the use of its product must be effectively portrayed actively to interest prospective consumers.

## Favorable characteristics of off-peak load

The favorable aspects of off-peak loads as developed by heat-storage systems cannot well be disputed from any point of view. Some of the important features of this class of service are of interest.

Off-peak service may be supplied under absolute control of the utility both as to time and quantity used. Either of these factors may be changed at will to suit operating conditions and customer requirements.

Off-peak service is not limited to night sales. It has

### *Comparative Cost of On- and Off-Peak Water Heating*

Customers Demand 1,500 Watts Each. Annual Use, 3,600 Kw.-Hr.

The data in this table represent actual costs in utility service. With on-peak service the losses shown are obviously unavoidable under the assumed conditions. The omission of any cost on account of fixed charges does not remedy the situation and make on-peak service profitable. Losses are inevitable whenever the costs chargeable to the service exceed the increment costs chargeable to the water-heating load.

**Off-Peak Service**

New Investment at Customers' Premises

| | | |
|---|---|---|
| New meter | $10.00 | |
| Time switch | 20.00 | |
| **New plant investment** | $30.00 | |
| Fixed charges at 12½ per cent | | $ 3.75 |
| Maintenance cost of new investment | | 1.00 |
| **Total added plant costs** | | $ 4.75 |
| Added costs per kilowatt-hour (3,600) | | $0.00132 |
| Increment production cost including added maintenance costs—kilowatt-hour | | $0.00325 |
| Added system losses 10 per cent | | $0.000325 |
| **Total costs per kilowatt-hour sold** | | $0.004895 |
| Revenue from 3,600 kilowatt-hour at 1 cent | | $36.00 |
| Total costs | | 17.62 |
| **Net income gain** | | $18.38 |

No credit given here for improvement in system efficiency and load factor.

**On-Peak Service**

System Investment $500 per Kilowatt of Maximum System Load

Estimated diversity factor = 3

Resulting demand of customer at time of maximum system load = 500 watts

| | | |
|---|---|---|
| Plant investment $= \frac{\$500}{2} =$ | $250.00 | |
| Fixed charges at 12½ per cent | $ 31.25 | |
| Fixed charges per kilowatt-hour (3,600) | $0.00868 | |
| Production, operating and maintenance costs per system per kilowatt-hour sold | 0.02000 | |
| **Total costs per kilowatt-hour sold** | $0.02868 | |
| Total costs | | $103.25 |
| Revenue from 3,600 kilowatt-hour at $0.01 | | 36.00 |
| **Loss** | | $ 67.25 |

No improvement in system load factor or efficiency; may be the reverse.

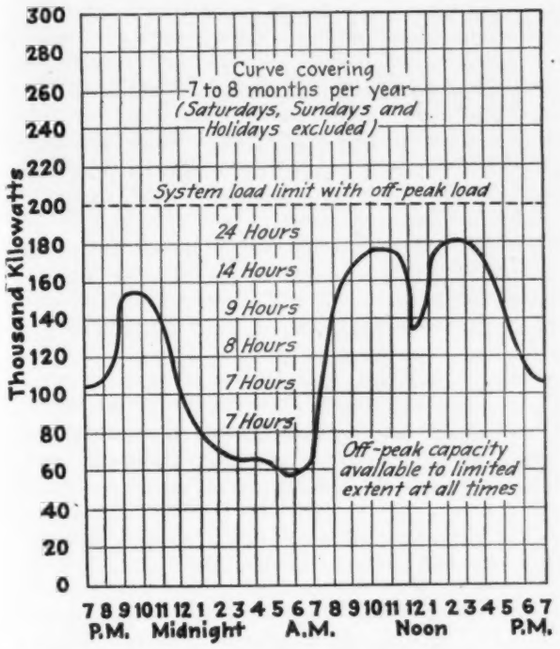



**Fig. 2—Typical summer load showing availability of off-peak power**

In this situation 25,000 kw. of off-peak capacity is available 24 hours daily, seven to eight months per year, and 20,000 kw. additional for fourteen hours daily. With skillful engineering it might be possible to serve some 40,000 customers using 1,500-watt units with off-peak water heating for eight months per year, but not over 15,000 such customers for twelve months. Auxiliary sources of heat would increase the latter number, and the selection of heater units best adapted to customer and company conditions may also serve in extending this service to a maximum number of users. Applications covering daily short-time use at higher rates of consumption can unquestionably be developed to absorb additional off-peak capacity if adequate engineering is applied to the problem.

Figs. 1 and 2 both show the necessity of carefully weighing system rather than substation load conditions in undertaking to provide off-peak service.

been shown that seasonal conditions offer great opportunities for extensive sales of this service at various times of the day throughout the year.

The cost of off-peak service may be determined with a degree of accuracy not attainable in ascertaining the cost of other forms of service, where the segregation and allocation of plant investment, operating and maintenance costs are necessary to secure final results.

The effect of off-peak loads on production costs will always be favorable as the direct result of improvement in system load factor, this in turn assuring more efficient operation of production facilities than would otherwise be possible. Cost studies of certain systems have shown that the improvement in efficiency thus secured has effected reductions in the cost of generating the balance of system outputs, ranging from 10 to 16 per cent, after deducting the actual cost of generating and off-peak load.

The high power factor of the water-heating load exerts a favorable influence upon other system conditions by raising its power factor during light-load periods, when the power factor is naturally the lowest, to higher values than would ordinarily be attained without the use of corrective apparatus.

The low rates at which off-peak service must unquestionably be sold demand that any additional investment required to supply this service be kept at a minimum. The added investment thus required for each off-peak customer, taking capacities up to 1,500 and 2,000 watts, will usually not exceed $30. This covers the cost of a time switch and a separate meter, which is considered desirable. It may well be that the time switch should be supplied as a part of the customer's cost, although maintained by the utility. This is a mere matter of company policy. This cost assumes that service capacities will usually be adequate for 230-volt heater units up to 3,000 watts, as will always be the case where three-wire services are available.

While 230-volt units are most desirable, 1,500-watt, 115-volt units may be satisfactorily operated from two-wire services, since no questions of regulation of voltage are involved during off-peak periods. In some locations changes will be required in transformers and secondary mains where they are unsuited for the heater loads in question, but as changes of this character will naturally be required to serve other appliance loads in the near future, their cost should not be allocated entirely to any proposed off-peak load.

The engineering and commercial aspects of off-peak service should be closely studied from every possible

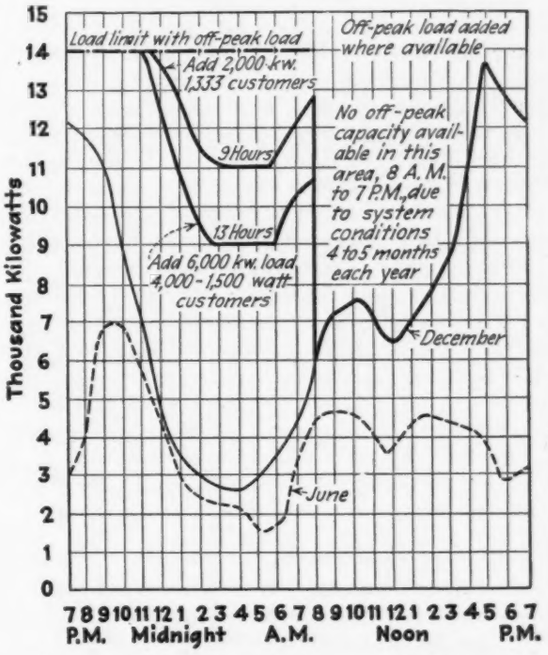



**Fig. 3—Typical load curves of city and suburban a.c. substation for December and June**

Here 6,000 kw. is available daily from 7 p.m. to 8 a.m., four to five months per year, to serve 4,000 customers. From 11 p.m. to 8 a.m. 2,000 kw. more is available, and this might serve 1,333 additional customers with small families or others whose use of hot water is below the average; or else, 1,000 customers using 2,000-watt units to provide for an average use of hot water. This winter curve demonstrates the limitations which must be placed on the sale of off-peak service from a system with loading conditions as in Figs. 1 and 2. The summer curve is obviously favorable to the sale of much larger quantities of off-peak load. It is again apparent that substation conditions do not at all conform to system conditions in a mixed system.

angle to insure its supply under the most favorable conditions.

Residential hot water service may be secured in a number of ways, among which are the following:

(a) A coil in the kitchen range with an auxiliary storage tank.

(b) A coil in house heater with an auxiliary storage tank.

(c) An independent instantaneous type heater.

(d) An independent storage type heater.

(e) An independent storage type heater in series with a coil in the kitchen range or house heater.

From the electric utility point of view the latter method is preferable, since it may be assumed that the use of electrical energy will reach a maximum in the summer and be reduced in the winter months. Extended observations of this factor indicate that the average use of energy for this purpose is reduced about one-third during the period such auxiliary sources of heat are in use.

Promotional efforts should, therefore, favor this method as the one securing the lowest cost to the user and at the same time enabling the utility to serve the largest possible number of such consumers.

### Low-wattage systems attractive

Low-wattage units up to 1,500 and 2,000 watts offer the most desirable returns. Their advantages are not generally understood. Low-wattage installations invariably develop the highest efficiencies. They may usually be connected to existing wiring installations without requiring changes in interior wiring or in service connections, if actually limited to off-peak use. They, therefore, involve the lowest possible installation costs.

High-wattage systems in excess of 3,000 watts, on the contrary, whether used on or off peak, invariably require changes in house wiring and in distribution systems involving high costs to provide necessary capacity. These costs may frequently discourage the use of service for this purpose regardless of its merits. Such units when supplied under on-peak rates invariably develop high operating costs.

Electric heater units should preferably be interchangeable within reasonable limits. Two units per tank offer some advantages over single-unit installations, where rapid heating of limited quantities of water at the top of the tank more satisfactorily meets customer requirements. Two-unit equipments may more satisfactorily meet electric supply conditions. The savings effected with two units will usually justify the use of time switches to control each unit.

Automatic control is to be preferred as a further guarantee of efficient operation. Where manual control has been used the use of hot water has been materially reduced and, therefore, the possible use of energy curtailed, with loss of income to the utility.

Well-insulated tanks are absolutely necessary for the efficient storage of hot water. Failure to recognize this fact will result in excessive losses from radiation, with resulting high costs, which will discredit the method and prevent the maximum expansion of sales for this class of service.

The modern mixing valve, which may be adjusted to reduce the temperature of the water used to a lower value than that at which the water is stored, is an important factor in the successful operation of storage systems. Waste at the faucet and radiation losses in piping are materially reduced through its use and the quantity of usable hot water is increased one-third to one-half beyond the amount otherwise available.

The control and protective equipment applied to hot-water storage systems affords full protection to both consumer and company.

Timing mechanism, supplemented by thermally controlled relays, insures automatic control of charging periods and temperature limits, while safety valves assure against explosive conditions, should such exist due to improper installation or operation. Tank sizes have been standardized in a sufficient number of capacities to meet any conceivable customer requirement.

It is perhaps presumptuous to discuss rates for off-peak service at this time, in view of the pronounced differences of opinion which exist in the industry as to the propriety and effectiveness of such rates. Rates,

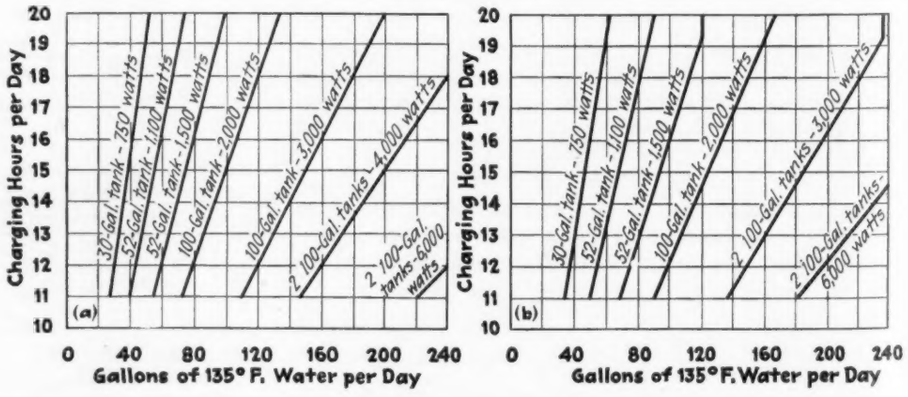



**Fig. 4 — Performance of water heaters at various charging hours and rates of water usage**

(a) Water is admitted at 35 deg. (b) Similar data with water entering at 55 deg. In each case the hot water temperature is 200 deg.; a mixing valve reduces the temperature of delivery to 135 deg., and the efficiency of the heating cycle is taken at 80 per cent. These curves indicate that the amount of hot water made available per kilowatt-hour input varies from 2.5 gal. with 35-deg. incoming water to 4.2 gal. with 55-deg. water. From equally reliable sources values as high as 5 to 7.4 gal. per kilowatt-hour are reported in normal service. Under identical conditions the hot water secured appears directly proportional to the energy input, and it makes little difference at what rate energy is utilized within the limits shown by the diagrams. Thus, if existing service conditions permit and off-peak capacity is not limited when available charging hours are shorter than can properly be utilized with 1,500-watt units, then 2,000-watt or 3,000-watt heaters may be economically used. Under such conditions two heater units per tank, each independently controlled may prove a solution.

however, are the principal element in the problem. The broad issue is as to whether the type of business under discussion may be sold under regular rates without restriction as to time of use, trusting that the diversity of use will result in a low use of current during the system peak hours and thus involve a relatively small investment to furnish the service, or, whether it is more desirable and profitable to furnish the service under off-peak rates with the attending minimum costs involved for supplying such service.

Studies of the comparative cost of service under the two methods seem to furnish a clear answer to the problem.

Viewing first the competitive methods by which consumers may secure the desired service, it will be granted that electric service rates to be of interest must at least enable the service to be offered on a competitive basis as to cost, even though other outstanding advantages may accrue from its use.

Adherents to the use of regular rather than off-peak rates for this service point to a favorable effect of diversity of use in keeping the combined demand to low values, with resulting favorable effect upon plant costs. This point of view overlooks the fact that the cost of the added kilowatt-hours delivered during peak-load hours is abnormally high and that the addition of this load may actually reduce the system load factor, through enlargement of the valley periods in the system load. It may well be questioned if this policy is tenable in view of somewhat definite experience data which show unmistakably that a high percentage of storage heater units actually take current across the peak, in systems where no restrictions are in effect as to time of use.

One important company has observed that the average demand per heater across the system peak is approximately 20 per cent of the aggregate connected heater load.

Another company finds that a great majority of all heaters connected are continually operated across the peak during the winter months.

Such diversity as does develop is favorable to power house investment, but in no way relieves much of the distribution investment required to serve, this frequently aggregating 60 per cent or more of the total plant costs.

On-peak use must inevitably seriously affect the voltage regulation of the service of consumers using water-heating systems, which is in no way compensated for by diversity factors. Only an increase in service capacity to carry the increased load can remedy such conditions. Such changes are costly.

To be applicable to this business, on-peak rates must usually contain a low follow-on step, which may be considered to be the cost which would apply to the added use for energy applied to storage installations. Such rates are open to objections if the amount of energy which must be used on the higher steps does not permit the consumer to reap the full benefit of the lower step for this proposed use. On the other hand, the effect of the low step will usually be to reduce unnecessarily the return which may be secured from the operation of other classes of use, for which there is no alternative method of supply.

The other point of view produces clear-cut results without any visible disadvantages.

Off-peak service for heat-storage systems, where supplied through a separate meter, involves minimum costs which may be accurately determined in advance. Such rates should in theory be lower than the lowest step on any rate applying to residential service.

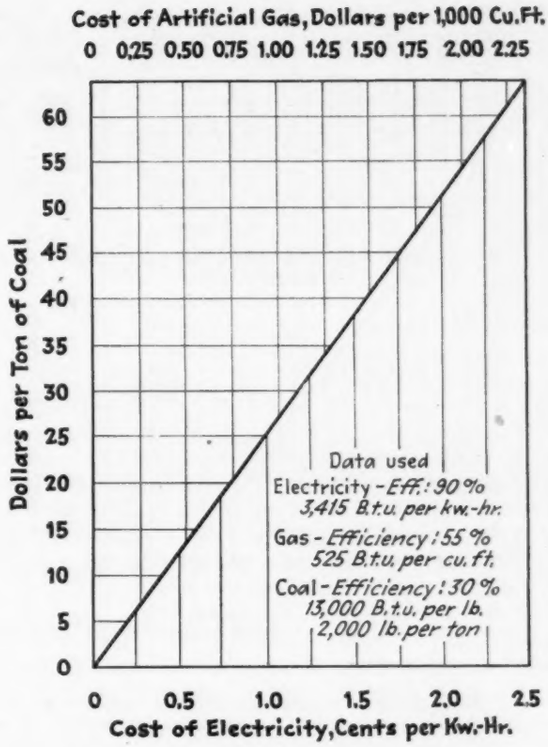



**Fig. 5—Comparative cost of fuels for water heating**

If sold at off-peak rates of 1 cent per kilowatt-hour, as may properly be done by many companies, the competitive position of electric water heating is unassailable, even ignoring other overwhelming advantages.

Most utilities can sell absolutely off-peak service of this character from 1 to 1½ cents per kilowatt-hour and profit thereby.

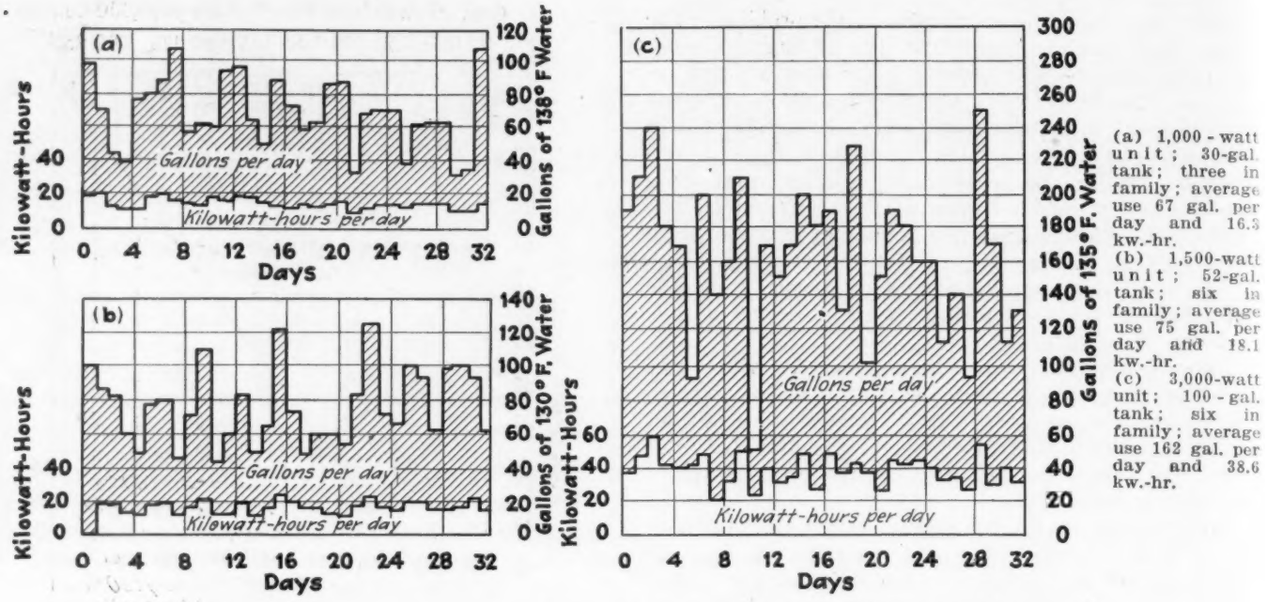
Off-peak rates should recover in full all costs chargeable to the production and delivery of off-peak power. These will usually include: Increment production costs, including fuel and added operating and maintenance costs, if any; cost of added losses in transmission and distribution; fixed charges, operating and maintenance costs on new investment in meter and time switch.

Reliable statistics show that the storage type water heater may reach an average annual use of 3,600 kw.-hr., equal to:

8 times the present national average customer's use.
3 times the average range use,
6 times the average refrigerator use, and
13 times the average oil burner consumption.

Surely such comparisons show that this class of service warrants intensive development.

Off-peak rates for this service should create no pressure for changes in other rates, since their charges should be based upon definite costs with which other rates are not involved. However, the development of a substantial volume of this business should materially increase the net earnings of any company and thus provide funds which might find their best use in modifying




(a) 1,000-watt unit; 30-gal. tank; three in family; average use 67 gal. per day and 16.3 kw.-hr.
(b) 1,500-watt unit; 52-gal. tank; six in family; average use 75 gal. per day and 18.1 kw.-hr.
(c) 3,000-watt unit; 100-gal. tank; six in family; average use 162 gal. per day and 38.6 kw.-hr.

**Fig. 6—Hot-water usage and energy consumption for three installations**

The variations stress the care which must be used in undertaking to supply this class of service. Wide variations in use strike the analyst's attention, and even the weekly wash days are not wholly responsible for these. It will be noted that the daily charging hours range as follows:

1,000-watt customer maximum 22; minimum 11; average 16.3 hours.
1,500-watt customer maximum 16.6; minimum 11; average 12.1 hours.
3,000-watt customer maximum 19; minimum 6.66; average 12.86 hours.

It also appears that days of high or low energy consumption do not always coincide with maximum and minimum use of hot water. The amount of storage available at different periods seems to account in some measure for these variations. The curves show that by substituting 1,500- and 2,000-watt units for 1,000- and 1,500-watt units used by customers (a) and (b), their full requirements could be met in a charging period of eleven to twelve hours if necessary to meet system conditions. If necessary and permissible, the addition of a second heater unit under separate control, to insure its use only when additional off-peak capacity can best be furnished, would enable the third customer to be supplied in less than eleven hours' charging. These examples of actual service installations well illustrate the flexibility of electric heating to meet local conditions by using heater units of varying capacities.

the cost of service under other rates, thus popularizing the service in another direction.

In a final determination of an off-peak rate for water-heating service the greater responsibilities assumed by our Northern utilities during winter months may warrant a higher charge for the service during that period than for the balance of the year; thus, if the rate for eight months was 1 cent, a charge of 1½ cents might be fair for the remaining four months. Company policies and conditions of service must necessarily govern such matters.

Selling energy for water-heating service under off-peak rates which are truly competitive should be an easy task since the outstanding merits of electric installations, if properly engineered and installed, leave little basis for argument in favor of other methods.

The cost of water-storage equipments ranges from $100 to $150 or more for the several available sizes. A plan under which the utility finances the first cost and installation of the equipment and then permits the consumer to discharge the obligation in monthly payments will undoubtedly accelerate the use of electric energy for this service.

Among the many opportunities which will always be open for the sale of energy for water-heating service new residential construction ranks first in the number of available prospects. Here, with only new construction involved, the installation may be made to conform to precise standards which will insure the highest operating efficiency for the completed installation. Adequate service conditions will be available from the first, and customer satisfaction should follow without question under such favorable conditions.

In apartment buildings where hot water is furnished to tenants by the landlord, it should be possible to install automatic electric heating equipments to displace many of the present hot-water-heating installations which require janitor service, fuel, ash removal and other care for their operation. In such locations the substitution may prove profitable for the owner and more satisfactory to the tenants, who would then receive real continuous service, unaffected by the vagaries of the usual janitor service.

The absence of fires, open flames or sparks of any kind should make this method of securing hot water attractive to garages, where car washing is one of the services rendered to clients.

Restaurants, barber and beauty shops and many other classes of business should prove good prospects for the use of off-peak water-heating service.

Other and larger fields for the use of off-peak service are being developed. Hot-water-storage systems for space heating in residences have rendered satisfactory service in trial installations for several years. The results secured seem to justify that serious consideration should be given to the development of this load. As

such installations usually require service capacities of 30 kw. or more, it will be evident that they will require different treatment than do those capacities which have been considered herein.

Space heating with hot-water-storage systems has an unlimited field outside of purely residential service. It is now being applied to small automatic telephone stations where the maintenance of an even temperature and a desired humidity are important factors in the successful operation of these station equipments. Manual labor otherwise required may thus be dispensed with and substantial reductions in building costs secured through the omission of chimneys and smoke flues and other special construction. The high-quality operation and the saving in labor and construction costs make this type of service attractive to operating interests.

A recent technical article indicates that consideration is being given to a plan for using the storage system to heat a large apartment building in which space is not available for the installation of the usual steam-heating plant. The plan under consideration contemplates a storage system for each apartment, with the tanks installed in convenient locations in the rear hallways. A single riser of suitable capacity to serve all heater units may be metered at one point and all energy be billed to the owner, who furnishes heat under the usual rental agreements. The hot-water supply may be secured in the same manner. It will be obvious that such an installation will involve the use of large amounts of energy, which must naturally be low in cost to be attractive to the consumer. Off-peak service seems to be the complete answer to the cost problem.

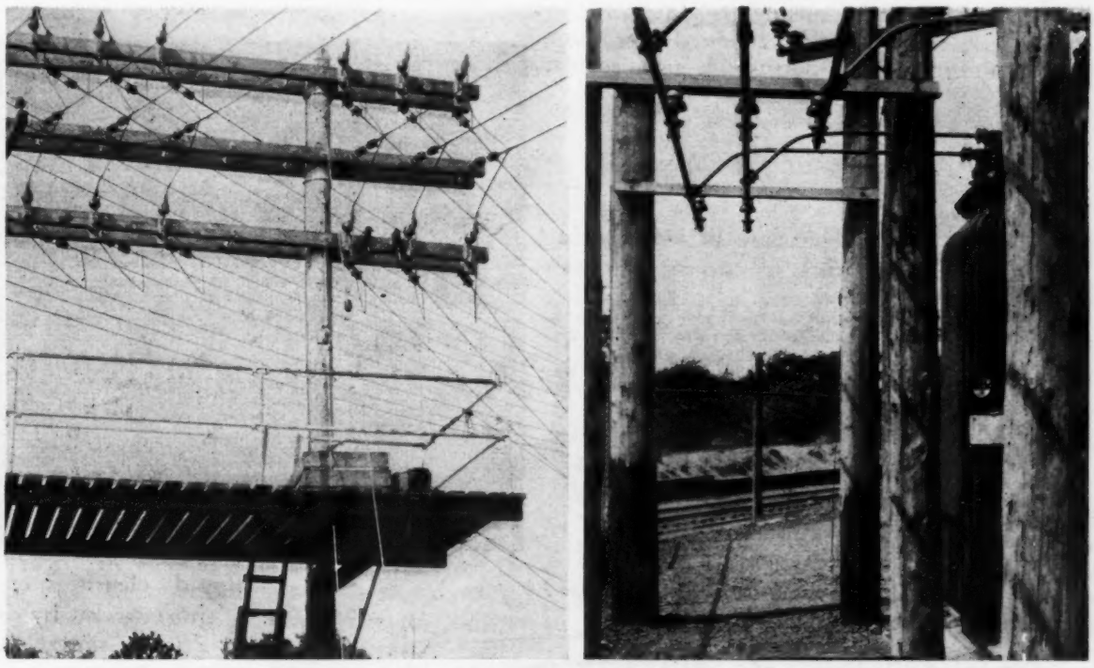
From every point of view, it would appear that the question of off-peak supply should now be approached with an open mind and every possible effort be made to dispose of the surplus output, which can thus be made available to the financial benefit of both utility and public interests.

▼

# Getting Results with Minimum Material

Economy of material without sacrifice of service reliability features the newer outdoor substation construction of the Cape & Vineyard Electric Company at Falmouth, Mass. The method of taking off three-phase, 2,300-volt loop circuits from a wooden-pole structure at the delivery end of the premises attracts attention because of its simplicity. One end of each outgoing loop is dead-ended on strain insulators bolted into the top double crossarm, and the returning end is similarly terminated on the lowest of the three double arms. Taps from the phase wires of each loop connect with the terminals of corresponding disconnecting switches mounted on the top and bottom arms. From the other terminal of each switch a tap is carried to the corresponding phase wire attached by a strain insulator to the middle arm, this middle arm carrying the feeders from the substation proper to the 2,300-volt outgoing loop circuits.

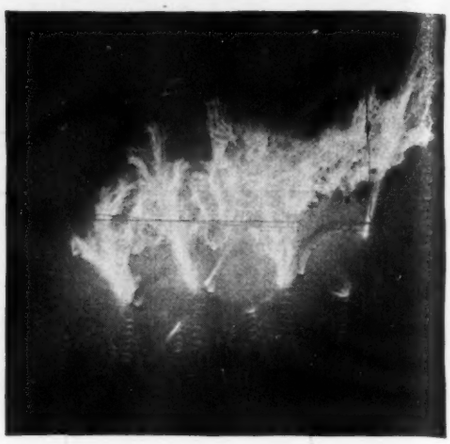
The use of copper tubing carried on inverted bus insulators supported on angle irons bolted to pole pairs provides a direct and simple means of carrying the starting voltage taps from a transformer bank to a 4,000-kva. synchronous condenser unit at Hyannis.



**Simplicity and economy in substation conductors**

Left—Three double crossarms provide an inexpensive take-off for loop feeders, each of which can be readily isolated by disconnecting switches from the supply end of the line. Right—Copper tube taps from a transformer bank minimize the material required in starting a synchronous condenser at Hyannis.

# Rupturing Characteristics of High-Tension Fuses



DATA on the current-interrupting characteristics* of high-tension fuses of various manufacturers indicate satisfactory operation at currents up to a peak value of over 8,500 amp. at 44 kv. and nearly 2,000 amp. at 110 kv. Tests have been conducted for several years by the Alabama Power System at a short-circuit laboratory constructed for the purpose at the Bessemer substation. Previous analysis had shown that many fuses installed to furnish high-tension protection for customers and rural transformer-bank installations were blown for cases of low-tension trouble which should have been cleared by the feeder breakers.

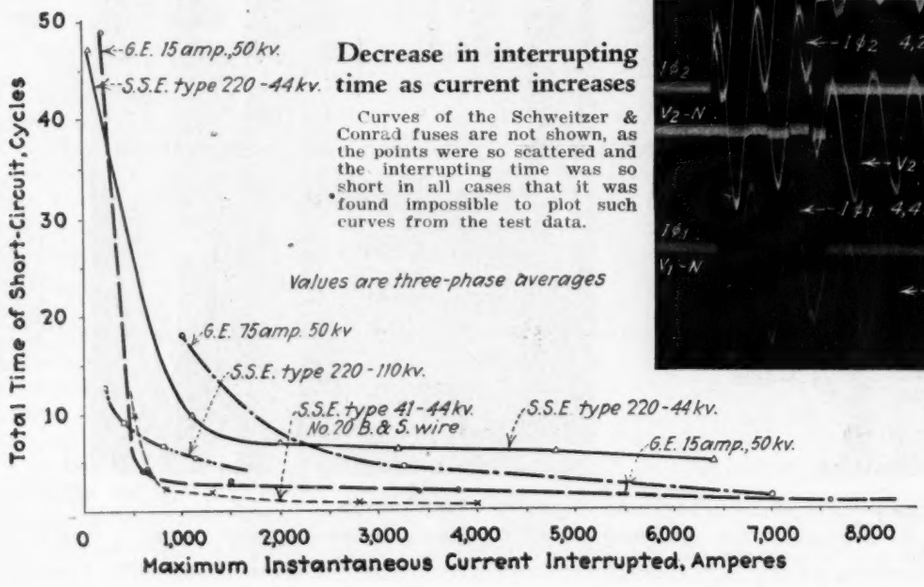
It was shown by the tests that at high current values the time required for a fuse to clear is much less than than for a breaker, and consequently the fuse would operate before the breaker. To meet the need of a fuse to which a variable minimum short-circuit time could be given, the type 220 relay fuses of the Southern States Equipment Company were developed.

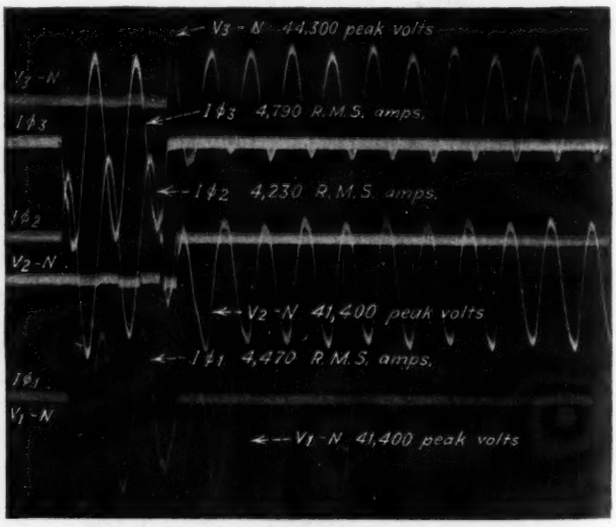
All of the fuses tested were of new types for which the maximum and minimum interrupting characteristics were desired. In general, the fuses cleared the fault satisfactorily with an arcing time of less than five cycles.

Recovery voltage, in the accompanying tables, is taken as the peak of the first cycle of voltage after the arc is extinguished. This is expressed in percentage of the normal voltage and varies from 21 per cent to 285 per cent of normal. No correlation of the recovery voltage with any of the other characteristics of the circuit seem indicated in the results.

Values of current interrupted are expressed as maxi-

*Based on fuse tests made by Alabama Power System by S. Murray Jones and W. D. Ketcham in 1929.


Total Time of Short-Circuit, Cycles
50
40
30
20
10
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
Maximum Instantaneous Current Interrupted, Amperes
G.E. 15 amp., 50 kv.
S.S.E. type 220 - 44 kv.
Decrease in interrupting time as current increases
Curves of the Schweitzer & Conrad fuses are not shown, as the points were so scattered and the interrupting time was so short in all cases that it was found impossible to plot such curves from the test data.
Values are three-phase averages
G.E. 75 amp. 50 kv
S.S.E. type 220 - 110 kv.
S.S.E. type 41 - 44 kv. No. 20 B. & S. wire
S.S.E. type 220 - 44 kv.
G.E. 15 amp., 50 kv.




**Rapid clearing of heavy short circuit by 50-kv. S & C type D fuse**

## *Performance Data for Fuses of Several Manufacturers*

(Under High Short Circuit and Low Current Values)

| | Total Cycles Short-Circuit Current — Phase | | | Maximum Instantaneous Current Interrupted, Amperes* — Phase | | | Recovery Voltage, Per Cent Normal — Phase | | |
|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | I | II | III | I | II | III |
| *50-kv., 15-amp.* | | | | | | | | | |
| General Electric: | | | | | | | | | |
| Type EF-1 | 1 | 1 | 1½ | 7,450 | 8,500 | 8,300 | Off film | 210 | 75 |
| Schweitzer & Conrad: | | | | | | | | | |
| Type D, No. 3 tube | 2½ | 3 | 3 | 8,400 | 8,680 | 8,750 | 105 | 79 | 77 |
| *50-kv., 75-amp.* | | | | | | | | | |
| General Electric: | | | | Off | | Off | | | |
| Type EF-1 | 1½ | 1½ | 1 | film | 8,460 | film | 141 | 52 | 100 |
| Schweitzer & Conrad: | | | | | | | | | |
| Type D, No. 4 tube | 2½ | 2 | 2½ | 8,170 | 8,520 | 8,520 | 93 | 102 | 76 |
| Type D, No. 5 tube | 5 | 4 | 5 | 7,070 | 7,810 | 7,700 | 147 | 151 | 63 |
| *44-kv.* | | | | | | | | | |
| Southern States Equipment Company: | | | | | | | | | |
| Type 41, No. 20 B. & S. wire | † | ½ | ½ | † | 4,300 | 4,310 | † | 256 | 164 |
| Type 220 | .. | 5¼ | .. | 4,600 | 4,600 | 4,810 | 95 | 56 | 152 |
| *110-kv.* | | | | | | | | | |
| Southern States Equipment Company: | | | | | | | | | |
| Type 220 | .. | 6 | .. | 1,172 | 1,065 | 1,163 | 112 | 153 | 91 |

*Does not in all cases indicate maximum interrupting capacity of apparatus since current in some instances was all that could be obtained.

†Waves illegible.

| | Total Cycles Short-Circuit Current — Phase | | | Minimum Instantaneous Current Interrupted, Amperes* — Phase | | | Recovery Voltage, Per Cent Normal — Phase | | |
|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | I | II | III | I | II | III |
| *50-kv., 15-amp.* | | | | | | | | | |
| General Electric: | | | | | | | | | |
| Type EF-1, three-phase | 3½ | 4 | 3½ | 702 | 525 | 638 | 146 | 37 | 285 |
| Type EF-1, single-phase‡ | .. | 49 | 49 | ..... | ..... | 144 | ... | ... | 131 |
| Schweitzer & Conrad: | | | | | | | | | |
| Type D, No. 3 tube | 2½ | 3½ | 2½ | 482 | 471 | 507 | 97 | 143 | 185 |
| *50-kv., 75-amp.* | | | | | | | | | |
| General Electric: | | | | | | | | | |
| Type EF-1 | 18 | 18 | 18 | 1,080 | 952 | 1,028 | 134 | 198 | 76 |
| Schweitzer & Conrad: | | | | | | | | | |
| Type D, No. 4 tube | 2 | 1½ | 2 | 434 | 448 | 510 | 162 | 192 | 78 |
| *44-kv.* | | | | | | | | | |
| Southern States Equipment Company: | | | | | | | | | |
| Type 41, No. 20 B. & S. wire | 16 | 16 | 15 | ¶ | 405 | 466 | 83 | 194 | ¶ |
| Type 220, three-phase | .. | 17 | .. | 401 | 388 | 407 | 97 | 129 | 115 |
| Type 220, single-phase‡ | .. | 67½ | .. | ..... | ..... | 84 | ... | ... | 132 |
| *110-kv.* | | | | | | | | | |
| Southern States Equipment Company: | | | | | | | | | |
| Type 220 | .. | 12½ | .. | 209 | 208 | 199 | 95 | 156 | 91 |

‡Some of these tests were single-phase tests which necessitated the insertion of a resistance in the circuit to get the low current values.

¶Waves illegible.

mum instantaneous values, as this was the only measurable value in many cases owing to the high speed of operation of the fuse.

The performance curves of the fuses show the total number of cycles necessary for the fuse to open and the arc to be extinguished at various values of short-circuit current. The type 220 S.S.E. fuses have an adjustable minimum-time characteristic which the others do not have. The curves and test data on these fuses were taken with the minimum time setting. The adjustable minimum current feature of these fuses is very desirable in tending to eliminate faulty operation of fuses on the same circuits as oil circuit breakers, which may in some instances have a definite minimum time of operation of between 10 and 20 cycles.

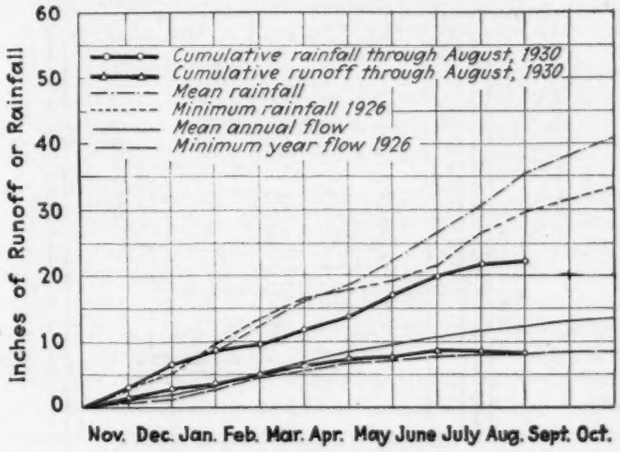
▼

# Drought's Effect on Stream Flow

Studies of the prevailing drought in sections of North Carolina and the effect upon stream flow for the period November, 1929, to August, 1930, inclusive, are presented herewith. Stream flow deficiencies at the end of August were not as great as in the minimum years 1925 and 1926 on any of the major river basins, although the cumulative rainfall deficiencies in several instances were the greatest of record. Ground water reserves from the excessive precipitation of 1928 and 1929 have been holding up stream flow fairly well. However, the flow is dropping off rapidly and was very low during August, in some instances very close to minimum August values.

The Roanoke River Basin, due to the fact that its drainage area is largely in Virginia and northwestern North Carolina, where drought conditions are worst, shows a rainfall deficiency greater than the minimum year of record. Stream flow for the period is slightly above the minimum of record. For the month both rainfall and stream flow were very near previously recorded lows.

A report by the Water Resources and Engineering Division, North Carolina Department of Conservation and Development, from which this information is taken, indicates that similar conditions prevail on other streams in that state.




**Rainfall and run-off Roanoke River Basin, North Carolina**

Mean rainfall is for the period 1890-1929

Mean run-off is for the period 1912-1929

# Summation Transformer Gives Overcurrent Protection

By R. E. CORDRAY

*Switchgear Department, General Electric Company, Philadelphia*

Lines which are to be operated in parallel are generally provided with some form of balanced protection, either balanced current relays or balanced power and overcurrent relays supplied by cross-connected current transformers. But when separate overcurrent relays are used for single-line operation or for bus faults their ampere setting must be high enough to permit a single line to carry double load. Hence they handicap the protection sought.

To raise the ampere setting of overcurrent relays automatically on two parallel lines when one of the lines is temporarily out of service for any reason the New England Power Company adopted a novel arrangement.

Referring to Fig. 1, an auto-transformer is bridged by an overcurrent relay and has its mid-tap connected to the common connection of the cross-connected current transformers. When both lines are in service practically all of the secondary current circulates through the overcurrent relay because of the relatively high impedance of the auto-transformer. This is indicated on the diagram by full line arrows. Hence with, say, 5 amp. secondary in both current transformers the overcurrent relay receives 5 amp.

If one of the two parallel lines is now removed from service the load on the other line is immediately doubled. The double value of secondary current, say 10 amp. (dotted arrows on Fig. 1), must now find a return path without going through the "dead" or idle, current transformer. It does this by flowing from each end of the auto-transformer to the middle, as determined by the ratio of turns, and thence out the mid-tap connection, through the balanced relays and back to the current transformer. This results in only half of the total secondary current flowing through the overcurrent relay. The effect of this is the same as though the overcurrent relay ampere setting was automatically doubled. In fact, the current through the overcurrent relay is equal to one-half the sum of the two current transformer secondary currents. Hence the name "Summation Transformer."

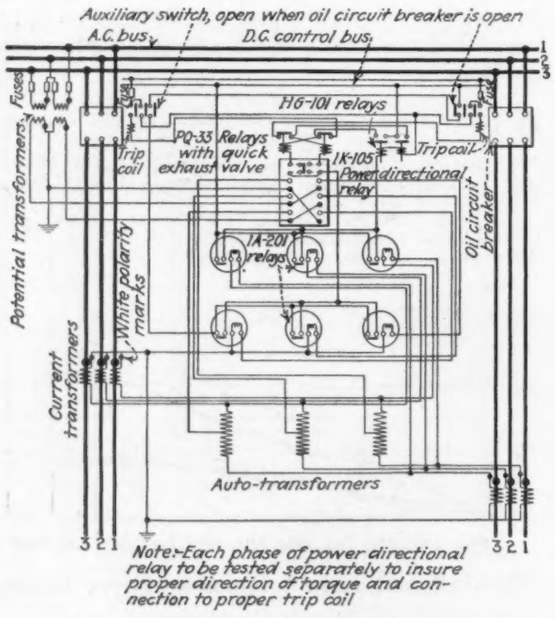



**Fig. 1—Mid-point of auto-transformer joins cross-connection of current transformers**

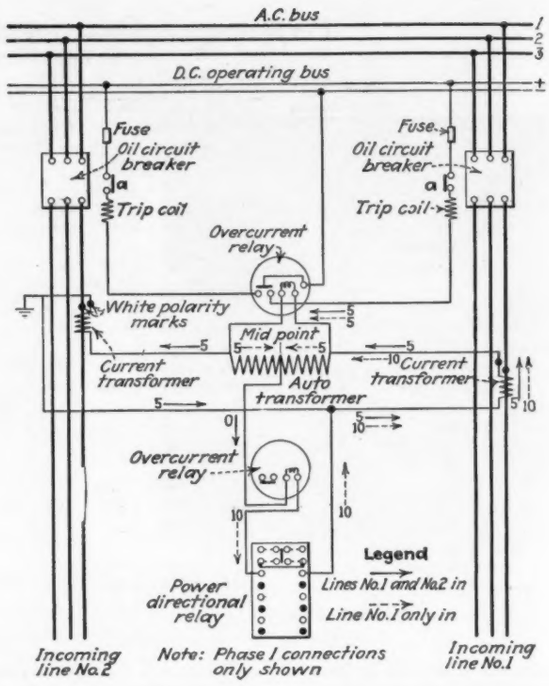



**Fig. 2—Lines have same overcurrent protection whether operated singly or in parallel**

It should be noted that the action is entirely independent of auxiliary switches on the breakers or other mechanical aids, but depends only on the presence or absence of current in the current transformer secondaries. Of course, a power-directional relay can be used in conjunction with the overcurrent relay if so desired.

Complete connections for the protection of a pair of three-phase parallel lines are shown in Fig. 2. For double-line operation there is a balanced power relay in conjunction with three separate overcurrent relays, one per phase. These relays become inoperative when either breaker is opened by auxiliary switches (*a*) in series with the contact circuit. Standard locking relays are provided so that the second breaker cannot be tripped by the overcurrent relays until a definite time has elapsed after the first breaker has been tripped by the balanced relays. This prevents any false operation as a result of current surges immediately after the first breaker has opened, such as might be due to generators attempting to get back into step, or for other reasons.

The lower set of three overcurrent relays and the auto-transformers give the same ampere setting overcurrent protection for one to two line operation. They trip both breakers by means of two auxiliary relays, although of course a three-contact overcurrent relay could be used.

# Industrial Uses* of Ultraviolet

**Degree of success attained with different applications. Problems that need solution before progress is resumed**

By E. E. FREE and C. C. CLARK

*The E. E. Free Laboratories*

INDUSTRIAL applications of ultraviolet radiation which have reached considerable importance may be classified under five heads:

I—So-called accelerated tests for the fastness of dyes, durability of paints, aging of fabrics and fibers, etc.

II—Testing or sorting substances by fluorescence produced under ultraviolet radiation or by other appearances different under ultraviolet radiation and under ordinary light.

III—Partial or complete sterilization of water or other materials, especially of water in swimming pools and of water used to make artificial ice.

IV—Treatment of foods or pharmaceuticals to create vitamine D.

V—Production of chemical reactions.

In addition to these five more or less strictly industrial uses of ultraviolet radiation, there is the well-known use of ultraviolet radiation for therapeutic purposes or for maintaining health in industrial organizations. Miners and other workmen whose occupations keep them out of ordinary sunlight now are treated with ultraviolet radiation as a substitute; for example, by the Bunker Hill and Sullivan Mining & Concentrating Company in the plant at Kellogg, Idaho. The American Telephone & Telegraph Company, the General Electric Company and many other organizations with large numbers of employees are experimenting with ultraviolet ray treatments to prevent colds and other respiratory diseases.

**Of the five strictly industrial applications outlined, the first one, accelerated tests for pigments and similar materials, we believe to be decreasing in importance rather than increasing.**

Although such accelerated tests undoubtedly are useful when properly controlled and interpreted, the results often fail to run parallel to experience in use. There are two probable reasons for this. First, the radiation from artificial sources usually contains larger percentages of the short wave lengths than sunlight and apparently act on many substances differently from the longer wave lengths which are plentiful in summer sunlight.

The second reason seems to be the different effects of high and low intensities of radiation. The amount of ultraviolet energy emitted by an artificial source may be scores or even hundreds of times greater than the similar energy intensities in sunlight or daylight. Relative chemical effects are not always parallel to the energy ratio. In examination during the past eight years of many chemical and related effects of ultraviolet rays we have encountered evidences strongly suggesting that some chemical effects which can be produced by high energy concentrations fail altogether to occur under low energy concentrations.

Our experience is that accelerated tests for fading and similar reactions under ultraviolet radiation must be interpreted with care and cannot be depended upon until parallelism with practical experience has been determined by trial. When further information is available concerning the reactions most likely to be produced by specific wave lengths and by different energy concentrations, these accelerated tests may prove more useful industrially.

**Testing by fluorescence or by other differential appearance under ultraviolet radiation impresses us as having more hopeful industrial possibilities.**

Differentiation of minerals, as used in the operations of the New Jersey Zinc Company, for several years, depends upon the fact that some of the minerals present in this company's ores fluoresce under ultraviolet radiation, some with different colors, while other minerals do not fluoresce. If the mill tailings intended for rejection show general fluorescence or bright fluorescent spots, this indicates that valuable material is being lost. Many minerals show more or less fluorescence under proper wave lengths of ultraviolet radiation.

It seems that methods of this type should find wider application than at present in beneficiation of ores or other mining and metallurgical operations. Portable outfits producing ultraviolet rays have been suggested, for example, for the use of miners at a tunnel face to

**Comments made before I.E.S. at Richmond, Va., convention.*

determine whether or not the desired vein is being followed.

The chief essential in developing such uses probably is that mining and metallurgical experts be familiarized with the utility, and also with the limitations, of such ultraviolet methods.

**Ultraviolet radiation already is much used for fluorescent tests of oils, drug products and related materials.**

It is generally agreed, as our own tests indicate, that vegetable oils of similar chemical composition but from different sources can be distinguished with assurance by the varied colors and intensities of their fluorescence under suitable ultraviolet rays. Wide use of such tests must await, however, systematic investigation of these fluorescences, and this investigation must take account of a factor usually neglected—the varied effects of different wave lengths of the ultraviolet spectrum. For example, the differentiation of certain samples of olive oils can be conducted more easily under monochromatic radiation of approximately 2,800 Angstroms than in the mixed radiation usually employed. After systematic study of the fluorescences of many samples of olive or other oils from different known sources it would be possible, we believe, to construct small, cheap and convenient ultraviolet equipment by which unknown samples of these oils could be identified promptly and assuredly even by relatively unskilled persons.

Ultraviolet methods of testing gems to distinguish true from false have been devised, we are informed, by the Phillips Lamp organization in Holland. Ultraviolet rays for testing drugs like cocaine have been used by the Parisian police authorities and others. Dr. F. M. Litterscheid of London has reported the use of ultraviolet rays to detect the presence of dirt in dairy milk.

Even the briefest mention of the possibilities of ultraviolet photography would be incomplete without some reference to the important work of F. F. Lucas of the Bell Telephone Laboratories, whose methods and instruments for microscopic photography by monochromatic ultraviolet radiation have pushed the limits of photomicrography to a resolution of approximately 100,000 lines per inch.

**The useful possibilities of ultraviolet radiation as an analytical tool are unlikely to be realized with completeness, however, until monochromatic radiation becomes usual instead of the mixed radiation now commonly employed and until systematic tests are made of the behavior of different known materials under these monochromatic rays.**

For these purposes we constructed four years ago, with the much-appreciated help of the special products section of the General Electric Company, a large monochromator using 5-in. prisms and 7-in. lenses of clear fused quartz—an instrument since duplicated for several other laboratories. With this instrument the ultraviolet spectrum between 2,200 and 4,000 Angstroms covers approximately 13 linear inches and contains substantially more energy than usually is obtainable. Below 2,500 Angstroms the instrument is not fully satisfactory for the reason that the fused quartz used is not completely transparent to shorter wave lengths.

Twenty years ago it was predicted that sterilization of food products, beverages, candies, and the like, by ultraviolet rays would become a common procedure. But it has not done so.

The chief reason for this disappointment probably is the relatively slight penetration of ultraviolet radiation into the majority of such organic materials. For the sterilization of fruit juices, for example, we have found that the juices to be treated must pass under the ultraviolet radiation in a layer less than one-half millimeter thick, which renders the process expensive and is likely, also, to damage the juice by oxidation or evaporation. Similar difficulties have been encountered in the ultraviolet sterilization of liquid milk. Even in the industrially successful processes of sterilizing water by ultraviolet rays the sterilization is not complete, although sufficient to reduce the organisms to what is considered a safe number.

For materials not intended for human consumption ultraviolet sterilization possibilities may be more favorable, as, for example, in the sterilization of catgut for surgical sutures or in sterilizing surgical instruments. However, it may be doubted whether ultraviolet radiation, effective germicide though it is, will ever be as cheap, convenient or satisfactory for ordinary germicidal needs as are the older and more familiar devices of heat or chemical bacteriocides.

**The industrial record of ultraviolet rays in analysis and sterilization has far from fulfilled the expectation of its friendly prophets of two decades ago. However, this is offset by the recent and largely unexpected development of processes for the production of vitamine D in food and drug products.**

Researches into the character and effects of vitamines have established that the value of cod liver oil and similar substances in aiding bone production in the growing human body is due to the presence of this vitamine D. Absence of this vitamine from the diet results in the disease called rickets. The effectiveness of therapeutic ultraviolet radiation in the cure or prevention of rickets seems also to be due to the production of this vitamine D inside the human body, probably in the deeper layers of the skin. The most modern method of curing or preventing rickets now has become the administration of more or less concentrated materials containing vitamine D rather than radiation of the patient himself with the ultraviolet rays.

As a result of much chemical and clinical work by Hess, Windaus, Eidenow, Steenbock and others, there now is little doubt that vitamine D is an activated modification of a sterol, probably ergosterol. Presumably this activation consists in some photochemical modification of the sterol molecule, produced by the ultraviolet radiation. The most effective wave lengths apparently lie between 2,600 and 2,900 Angstroms, although some activation seems to be produced by wave lengths outside this range, even by X-rays or by cathode rays.

At present artificial ultraviolet radiation is announced as being used by the Quaker Oats organization to create vitamine D from ergosterol or other sterols present in cereals. Cod liver oil is radiated by Squibbs and other pharmaceutical concerns to increase its vitamine content. Radiated yeast and radiated ergosterol from yeast are

## Three Factors that Hamper Progress

It is probable that on precise investigation the effectiveness of different wave lengths of any selected chemical reaction will be found to differ. For efficient operation, ultraviolet sources should produce exclusively, or almost exclusively, the wave lengths most effective for the purpose desired. High intensity is desirable to shorten the time of treatment and to take advantage of the increased reaction velocities which seem frequently to occur only at high energy levels.

At the present time two general sources of ultraviolet radiation are practical for industrial use—the Cooper-Hewitt mercury arc and the carbon arc with or without special carbons. Neither of these sources reaches so high an intensity for a single arc as is desirable for many industrial purposes. Also, neither of these sources is monochromatic. Theoretically, filters may be used to select desired portions of the spectrum. It is even possible, in theory, to make industrial use of spectographic apparatus to select wave lengths by dispersion. Such expedients, however, are costly and inefficient. An important aid to extended industrial use of ultraviolet radiation would be the development of powerful, virtually monochromatic sources analogous to visible light sources like the neon tube. Systematic investigation of such sources is urgently called for.

Recently it was our task to make as accurate a measurement as possible of the quantity of ultraviolet radiation falling on the tobacco inside the Richmond tobacco-treating unit mentioned. No single method of measurement now available was found to be suitable. It was necessary to use three separate expedients—photographic spectography, a thermopile to measure the energy dispersed by a quartz spectograph and a series of methods depending upon the photo-electric cells sensitive to different parts of the ultraviolet spectrum.

Methods of such complexity are unsuitable for routine use. If ultraviolet radiation is to become an important industrial tool it will be necessary to have measuring instruments as simple as ammeters or foot-candle meters.

Most promising for purposes of industrial ultraviolet measurement, we believe, are the methods which depend on photo-electric cells. The most accurate and sensitive ultraviolet meter so far perfected we believe to be that of Dr. Harvey C. Rentschler, consisting of a special photo-electric cell attached to a condenser and a glow-discharge tube. The action of ultraviolet radiation on the photo-electric cell slowly charges the condenser, which then spills over at a predetermined voltage through the glow-discharge tube, producing one "count" on the counter.

However, indicating meters will become an industrial necessity in addition to integrating meters of the Rentschler type. Also, it is desirable to be able to make measurements at any selected part of the wave-length range instead of being confined, as in the present form of this meter, to the part of this range over which this photo-electric cell is sensitive. A hypothetical possibility is a photo-electric cell sensitive over the entire ultraviolet range and provided with a suitable optical system to admit selected portions of the wave-length range. For practical use this would require, also, a suitable amplifier to make the electric output of the photo-electric cell readable on some rugged type of micro-ammeter or similar instrument. Such an outfit is now under development.

**One important need is for more intense sources of ultraviolet radiation, especially of monochromatic ultraviolet radiation.**

•

**Another important desideratum is systematic information about the penetration of ultraviolet radiation into different material, about the reflectivity of materials probably useful for mirrors, and so on.**

•

**A third necessity for widespread use of ultraviolet radiation as an industrial tool is the development of better methods of measurement, both for wave length and for energy.**

•

being prepared by the Fleischmann yeast organization. Radiated varieties of dried milk and of several other food products now are being prepared or have been suggested. In England the J. O. Hickman dairy, at Rickmansworth, is radiating its milk cows with ultraviolet rays in the effort to produce milk and cream higher than usual in their content of vitamine D.

**The radiation apparently most effective in producing vitamine D is not necessarily the same in wave length as the radiation responsible for the supposed general benefits of artificial ultraviolet rays or of sunlight on health.**

The ultraviolet radiation of industrial material for the production of chemical reactions is another field in which performance has not equaled expectations.

Although the literature of organic chemistry notes hundreds or perhaps thousands of chemical reactions which can be modified or assisted by ultraviolet radiation, not one of these has received, so far as we know, important industrial application. One success of ultraviolet radiation in these processes has been, however, the treatment of patent-leather enamels.

In this case the action of the ultraviolet radiation seems to be facilitation of the oxidations involved in the hardening of "drying" oils like linseed oil. In the majority of industrial instances it is doubtful, however, whether such increases of oxidation produced by ultraviolet are sufficient or sufficiently valuable to justify the cost of the radiation. A more promising development is the use of ultraviolet radiation to treat the tobacco used by the American Tobacco Company for making Lucky Strike cigarettes.

The shredded tobacco prepared for use in cigarettes is exposed to ultraviolet radiation from 60-amp. alternating-current arcs constructed by the National Carbon Company and provided with type "C" carbons. The effects of this ultraviolet treatment on the tobacco have been tested and are found to involve an increase in what is called the "mildness" of the tobacco. Chemical tests conducted by A. L. Chesley, chemist of the American Tobacco Company, and by several independent laboratories show that this change in the tobacco is due, at least in part, to chemical modifications of acrid and irritating materials otherwise present in the tobacco or in the smoke from it.

At present it seems probable that the primary reaction is the production of active mon-atomic oxygen in the air close to the surface of the shreds of tobacco. Ultraviolet radiation is known to have this effect. The increased active oxygen then is believed to be responsible

for the oxidation of the irritating acids and other substances.

**The success of this method of improving the quality of cigarette tobacco is especially interesting for its promise of similar possibilities with other products. Many industrial materials, aside from tobaccos, foods or other materials to be used for human consumption, need to be put through processes involving oxidation.**

It is probable that irradiation with ultraviolet would increase many such rates of oxidation. The problem of practical use then becomes one of economics. Are the increased oxidations thus attained or the corresponding improvement of quality or shortening of time of treatment sufficiently valuable to justify the cost of the treatment? The answer usually will depend, we believe, upon the ingenuity with which the treatment is applied.

Many promising industrial applications of ultraviolet radiation have lagged because efficient mechanical design and economical operation have not received the attention and inventive ability which are necessary.

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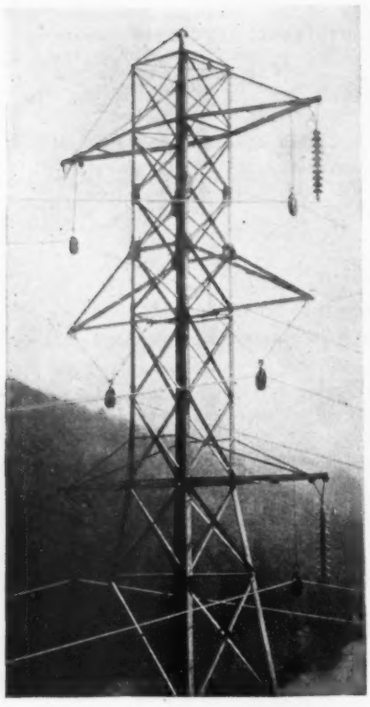
# Light-Weight "Traveler" Cuts Cost of Transmission Lines

By J. ELMER HOUSLEY
*Alcoa, Tenn.*



In order to facilitate and reduce the cost of transporting construction equipment for erecting 35 circuit miles of 150,000-volt transmission lines in the Smoky Mountains of eastern Tennessee the Knoxville Power Company adopted a cable-stringing snatch block composed of an aluminum sheave, 10 x $1\frac{5}{8}$ x $\frac{3}{4}$ in., fitted with roller bearings, wood beckets and a steel strap with drop link.

In stringing the cable this "traveler" was suspended vertically alongside the insulators on the top and bottom arm, a $\frac{3}{8}$-in. steel cable with a hook on the free end being looped over the arm and a loop on the other end slipped on the hook of the traveler. At the middle arm two log chains suspended the traveler from the bottom of the "v" arrangement, as shown in the illustration. The chains were provided with a ring at one end and a chain hook at the other end.

About 60 of these "travelers" were used in the construction of this 150,000-volt transmission line in the Smoky Mountains.

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# Oil Rehabilitates Joints of Twenty-Year-Old Cable

By E. F. DE TURK
*Assistant Superintendent of Transmission and Distribution Metropolitan Edison Company, Reading, Pa.*

Twenty-year-old 13.2-kv. underground cable joints which have become faulty are being rehabilitated by the Metropolitan Edison Company, Reading, Pa., through resort to oil filling. The cables are three-conductor, 300,000-circ. mil, with $\frac{7}{32}$ x $\frac{7}{32}$-in. manila paper insulation. The line consists of four cables about a mile long, all of them being carried in the same duct line between the power house and one of the main city substations.

The cables lie on a slight grade, and the failures have occurred consistently on the downhill end of the splice. No failures have occurred in the cable proper nor in the main section of the joint, except in a few cases for which there was a proper explanation. An investigation showed that the section of the cable immediately adjacent to the low end of the splice was quite dry in nearly every case, which was attributed to the downhill migration of the oil impregnation of the cable during its twenty years of service. From all indications the cables were in excellent condition, with the exception of this particular fault, and might be expected to give considerably more service.

Experimentation indicated that the insufficiency of oil in and near the crotch of the splice could be eliminated by introducing oil under pressure at the splicing sleeve. One of the splices in the cable was chosen for trial, and, after a complete dissection of the joint and the removal of all the old compound, the joint was remade with a new and larger sleeve and filled with transil oil. A pressure of 30 lb. was applied to the oil by means of an alemite gun, and this pressure was maintained for about one-half hour. Pressure was then released and the splicing sleeve capped. Similar pressure applications were made at weekly intervals, and after about six such treatments a total of about three quarts of oil had been introduced into the cable through this single joint. Pressure applications were then discontinued, and periodic inspection has disclosed that oil movement is now very slight, being affected only by temperature changes of the cable.

This rehabilitated joint is still subjected to very close observation, but it appears that the work has been a success and that it could be successfully applied to all the remaining joints in the cable line. A complete rehabilitation of this sort is far cheaper than the entire replacement of the cable, and there is every reason to believe that the old cable can be operated successfully over a long period of time if treated in this manner.

# Rural Electrification in France

By RENE P. CHAUVET

*Morges, Switzerland*

AS OF December 31, 1928, on a total of 37,981 parishes in France, 15,502 had no power distribution. There were at the time 5,800,000 customers for low tension, each using an average of 30.6 kw.-hr. for light and domestic purposes and 26.2 kw.-hr. for power. The customers represent 15 per cent of the total population.

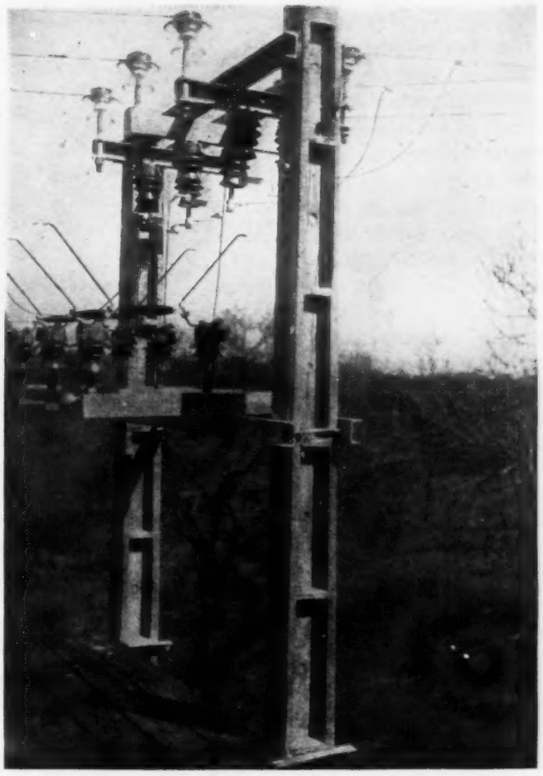
Inasmuch as the agricultural population is quite scattered and divided in numerous hamlets, the construction of distribution networks is made with the assistance of the state, which gives a subsidy of 50 per cent in the case of rural electrification if the kilowatt-hour use per inhabitant is guaranteed to be at least equal to 25 per year. Also, for other costs not covered by this financial help, the state offers money at a very low rate. If the grantee borrows elsewhere, even at a higher rate, the state gives a supplementary grant of 11 per cent, the above rates being based on a total cost for high- and low-tension lines and substations of $24 per inhabitant.

When the region considered is composed of hamlets only the grant of 50 per cent is based on real expenses alone. In this way the state has distributed since 1920 grants for about $28,000,000, and in 1928 $5,200,000 (131,000,000 francs) was thus expended.

A special service, reporting to the Ministry of Agriculture, the Rural Engineering Service, draws up the initial plans and controls the use of the subsidy. This service attends also to the distribution of water. Parishes to the number of 12,923 have appealed to this service for their electrification.

In addition to the state subsidy the local department can also give a subsidy, amounting in some cases to 50 per cent of the state grant. Some departments, however, give only the 10 per cent paid in fifteen annuities, others do not give any money but guarantee up to 80 per cent of the insufficiencies to meet the sinking fund annuities. In the most favorable case, with an electrification of hamlets, the total subsidy can attain 50 + 11 + 30.5 = 91.5 per cent of the expense, the balance being covered by a loan contracted by the interested utility. The subsidies are paid in proportion to the real expenses.

The public utility is often a syndicate of the interested parishes, formed with the permission of the authorities. This syndicate attends not only to the construction but also to the operation of the distribution system; in some cases, however, the system is given over to a co-operative, which is a subsidiary company, or leased to an electric system. For the costs not covered by the subsidies the syndicate issues 30-year bonds, for which a sinking fund is created by increasing the price of energy a certain sum ($0.04 sometimes).



**Rural line disconnecting switches on concrete pole**

10-kv. glass insulators are used with horn gap fuse made of fuse wire in a celluloid strip set between the horns.

Most frequently the syndicate is a purchaser of energy. It can buy energy from large power companies at a price approved by the State Ministry. For a voltage of 10 kv. typical conditions are as follows: (1) A fixed charge per kilowatt of subscribed energy ($9 yearly for less than 10 kw., reduced proportionately to $7.20 for more than 200 kw.); (2) a price proportioned to the use of energy ($0.01 per kilowatt-hour for less than 10 kw. or $0.009 for more than 200 kw. of subscribed power).

The above prices are based on a power factor better than 0.8. In case of a power factor less than 80 per cent the reactive energy is taken into consideration by a penalty of 1 per cent of the price of energy for each hundredth part below that figure.

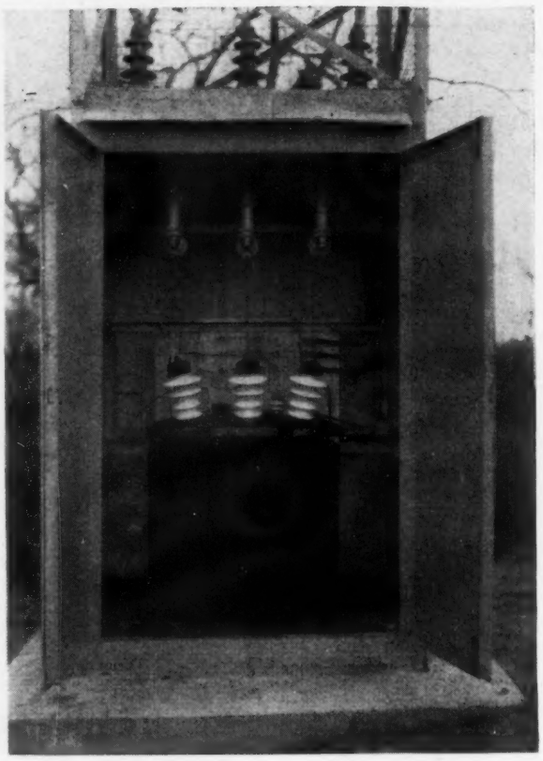
The energy is sold to the consumer, including the syndical surcharge of $0.04, at $0.11 per kilowatt-hour.

(As a means of comparison a groundman earns from $0.10 to $0.12 an hour.)

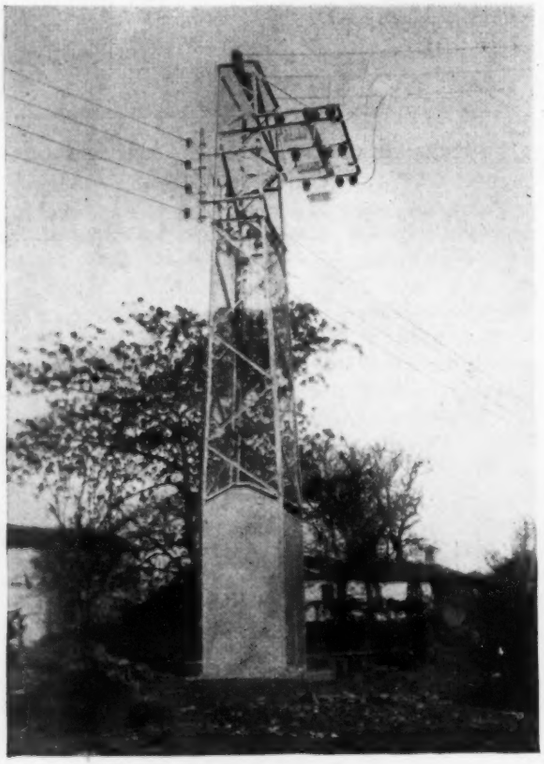
Before the beginning of the service the inhabitants are signed up by the syndicate and indicate their energy needs. Whoever does not subscribe before the service begins loses, because in putting off his demand till later the line from the nearest feeder to his home is then entirely at his cost. The lines are brought up to the houses they serve on condition that the owners authorize the location of poles on their properties. The service tap is at the consumer's cost usually, but some parishes carry this charge. Some syndicates execute the services on contract and collect a tax of $2.24 per acre for the farmhouses and from $2 to $8 for country houses.

The energy is transmitted at low voltage generally, but sometimes high voltage is used between important localities, and from these points hamlets are fed at 5 or 10 kv., this practice being followed by widespread syndicates. The low-tension distribution is done either at 125/220 volts or 220/380 volts; this last voltage is the most frequently used.

Wooden poles are used extensively, but the actual trend is toward the use of concrete poles. Copper conductors are used almost exclusively, aluminum alloys and copper-covered steel wires being rarely used. The minimum diameter authorized by legislation is 3.0 mm. for copper-clad steel wire. Insulators are usually of glass because of their low price. A two-piece glass insulator tested at 25 kv. costs $0.18 and low-tension one-piece glass insulators tested at 4,000 volts cost $0.06. Spans are usually 180 ft.



**Interior of cabin type transformer station**



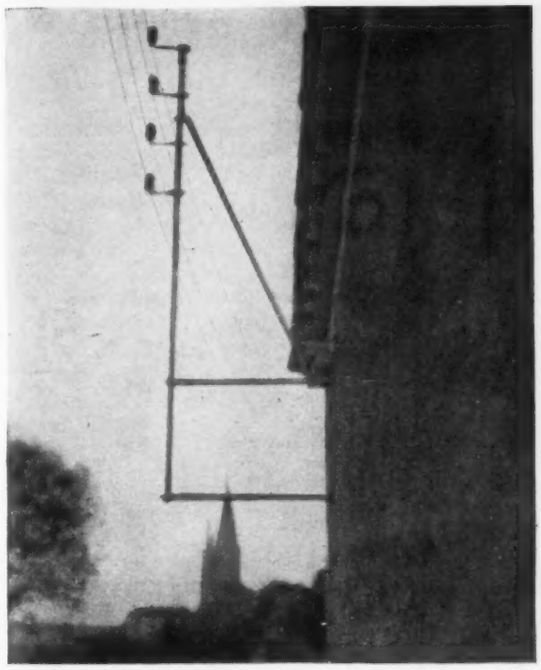
**Cabin type transformer station**
10,000/220/380-volt disconnect switches and choke coils

**Aerial type transformer station**
10,000/220/380 volts

On houses constructed of stone the line is supported by sealed brackets made up of merchant steel of square galvanized steel tube.

Transformer stations are nearly always of small power (7.5 kw.) and are established on steel masts. Masonry stations are justified only for large power and pole stations are of a limited duration. Each circuit at its exit from the station is protected by aerial porcelain fuses, inserted in the conductors.

Single-phase loads are served up to 1,000 watts (600 watts for motors). Squirrel-cage motors should not be used above 5 hp. The load is composed at first only



**A rural bracket service**

of light, and during the summer the rent for the hiring of the meter exceeds the sum due for the energy use. The only household appliance used is the electric iron. Refrigerators are unknown, but domestic pumps are widely used. Most of the deep-well pumps are of American construction.

A rural electrification in a country of little population includes 42 transformer stations, whereof 35 are of 7.5 kva., four of 10 kva., one of 15 kva. and two of 20 kva. for a population of 8,800. The following data apply to an entirely rural parish, electrified 100 per cent:

***Characteristics of Service in One Rural District***

| | |
|---|---|
| Population | 516 |
| Area, square miles | 5 |
| Number of houses | 124 |
| Transformer stations, kva | 4, 7.5 |
| Low-tension network: Four conductors, miles | 6.2 |
| Three conductors, miles | 4.8 |
| Two conductors, miles | 4.7 |
| Number of supports | 471 |
| Weight of copper of low-tension lines, lb | 17,200 |
| Number of motors of more than 1 hp | 4 |

Two- and three-conductor lines are used only for light.

# New Turbines Operate Well

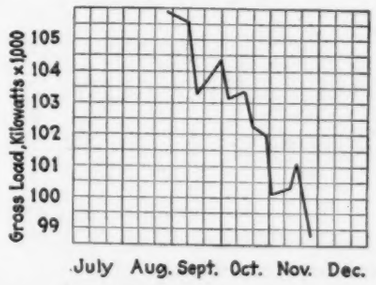
Broken lashing wires, spindle warpage, sticking of control valves and the loss of buckets and shroudings comprise the troubles which have developed in recently installed turbines, according to statements of operating companies in the turbine report of N.E.L.A.

The 160,000-kw. American Brown Boveri unit installed at the Hell Gate station of the United Electric Light & Power Company in June, 1926, developed a vibration in the low-pressure cylinder in January, 1929. Inspection showed several of the lashing wires in the two last wheels broken; there were also eight breaks indicated in wires of the sixth and seventh wheels. It was assumed that stresses due to soldering were the cause of the fractures and the lashing wires were removed and the turbine returned to service for trial operation. It did not operate successfully, however, and the strains caused fractures of the shroud band and of one blade. As service from this unit was important, it was returned to service without the last wheel on each end.

A Westinghouse turbine with the same steam and main generator capacity, but with a 5,000-kw.-hr. generator connected to the low-pressure shaft, was installed at the Hell Gate station in April, 1929. This unit has been operating without interruption except for one short period shortly after installation, when trouble was experienced with oil piping lines which supply the bearings and damper controls of the generator blower control mechanism. This was due to vibratory breakage of the oil lines and has been overcome by the substitution of steel for brass piping and improvements in piping arrangement and bracing.

In September, 1928, a 110,000-kw. Westinghouse unit was installed at the Hudson Avenue station of the Brooklyn Edison Company and shortly after developed a vibration due to spindle warpage. The high-pressure spindle was such that the leak-off from the high-pressure dummies passed through four holes in the spindle with

Curves from operating data on 94,000-kw. unit at Long Beach station of Southern California Edison Company. These deposits consist largely of sodium chloride and sodium carbonate and occur on the first fourteen stages, being heaviest on the fifth stage.




**Accumulation on turbine blading reduces capacity as much as 10 per cent**

four outlets between the ninth and tenth rows of blades. These holes were plugged and the vibration disappeared.

When the high-pressure element of this unit was inspected in July, 1929, one blade was found broken in the sixteenth and nineteenth rows and the lashing wires of the sixteenth, seventeenth, eighteenth and nineteenth rows were broken in a number of places. The sixteenth row was replaced with blades having a heavier section and nickel lashing wire was installed throughout, the diameter of the wire being increased in the four rows that showed weakness.

A 160,000-kw. General Electric tandem-compound, 1,500-r.p.m. turbine driving a 25-cycle double-winding generator which was installed at the East River station of the New York Edison Company in October, 1929, has given practically continuous service to date and has carried loads up to its full rated capacity.

A 165,000-kw. General Electric turbine at the Philadelphia station of the Ohio Power Company which began commercial service with different units in January, February and March of 1929 has given satisfactory operation with only minor troubles having developed. The difficulty consisted of sticking of control valves subjected to maximum temperature conditions where the clearance between stem and guide was incorrect. For intercepting valves in the piping between the high-pressure and low-pressure sections Venturi gate type valves operated by boiler feed pressure were installed. Faster operating valves were obtained by replacing the original ones with balanced disk globe valves actuated from the turbine oiling system.

A 94,000-kw. General Electric unit at the Long Beach station of the Southern California Edison Company has operated almost continuously at base loads around 100,000 kw. net. The major difficulties encountered were the loss of a few buckets and some shroud rings from the fifteenth stage wheel and a slight loss of capacity due to deposits from the steam adhering to the blades.

The blading failure occurred in June, 1929, about a year after installation. Seven buckets from the stage were broken off at the root where they were inserted in the wheel, and several sections of shrouding were missing from the fifteenth stage wheel, with some loose on the fourteenth stage wheel. No definite cause for the failure is known.

From time to time deposits on the blading have reduced the capacity of this unit as much as 10 per cent. These deposits are washed off when the unit is open for inspection and their rate of formation has been retarded by limiting the concentration of solids in the boiler drum to 850 parts per million.

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# Rural Programs Require Executive Guidance

By E. C. EASTER
*Chief Agricultural Engineer Alabama Power Company*

A successful rural electric program conducted by a power company must have executive guidance, just as must any other new or major activity. Any company which employs an agricultural engineer to conduct its rural electrification work without providing for executive guidance can expect only mediocre results, if any. The agricultural engineer must provide the company executives with facts pertaining to agriculture within the territory served, together with reports of the actual results obtained from rural electric service as they affect both the company and agriculture. With this information the company executive is enabled to formulate and put into effect a rural electric policy, in keeping with the company's general policies and activities, adapted to local agricultural conditions.

The agriculturists must be familiar with the way in which electricity can be satisfactorily used with equipment available, and should have some understanding of the problems involved in providing the service. The manufacturer must be familiar with the equipment requirements of the farmers and their adaptation to operations on the farm.

Results in rural electrification throughout the country indicate that where the above conditions are met the value of electricity to agriculture has been sufficient to make possible a very substantial and continued development.

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# READERS' FORUM

## New Data on Canadian Hydro Plants

*To the Editor of the* ELECTRICAL WORLD:

The following revisions should be made in the tabulation which appeared on page 519 of the September 20 issue of ELECTRICAL WORLD:

1. The item "Canadian Hydro-Electric Corporation, Ltd., Hawkesbury, 40,000 hp.," should be eliminated as we have no hydro-electric plant there, nor are we contemplating any.
2. The item "Gatineau Power Company, Low, 204,000 hp.," should be eliminated as this plant (Paugan) came into operation October 1, 1928, and your record covers 1929 or plants now under construction.
3. The item "Gatineau Power Company, Ironsides, 72,000 hp.," should read Farmers, 24,000 hp.
4. The figures which you have against the Bryson and Chelsea plants of Gatineau Power Company, immediately following, are correct.
5. You should include an item as follows: "Saint John River Power Company, Grand Falls, 60,000 hp." For your information, the first 20,000-hp. unit of this plant was started in 1928, the second and third units of 20,000 hp. each came into operation in 1929, and the fourth and last unit of 20,000 hp. will probably be started this year.

F. HARRIS,
Director of Publicity.
International Paper Company.

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## An Appreciation of the Artistic

*To the Editor of the* ELECTRICAL WORLD:

The printed picture of the George Westinghouse Memorial in the October 11 issue of the ELECTRICAL WORLD, opposite page 679, calls for special notice and comment. I presume this printed picture is a reproduction of a natural photograph and because of my knowledge of the insufficiency of printer's ink to produce each minute detail, I cannot help but feel that the original must be something to marvel at.

The picture could stand reproduction in color in your magazine at any time, and I am sure it would be appreciated by the rank and file of the electrical industry.

J. M. STIPPICK,
District Manager.
Wisconsin Public Service Corporation,
Manitowoc, Wis.

# Men of the Industry

FRANK W. PEEK, JR., chief engineer of the transformer engineering department of the General Electric Company, Pittsfield, Mass., has been elected a director of the American Institute of Electrical Engineers to fill the vacancy resulting from the election of William S. Lee to the presidency.

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C. E. BENNETT, general engineer of the Georgia Power Company and formerly manager of the electric department of that company, has resigned to become special research engineer for the Okonite Company with headquarters at Paterson, N. J. Mr. Bennett has been with the Georgia company nearly nineteen years, with the exception of the time during the war when he was with Hugh L. Thompson of Waterbury in charge of design and construction of industrial power houses and substations for the Scovill Manufacturing Company. Earlier in his career he was connected with such prominent consulting engineers as C. O. Lenz, L. B. Stillwell and with the J. G. White Company of New York. Mr. Bennett is a fellow of the American Institute of Electrical Engineers and has served on many national committees of that association, of the National Electric Light Association and the American Electric Railway Association.

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R. A. SHARON, for the past three years assistant to the vice-president and general manager of the Great Western Power Company of California, with headquarters in San Francisco, has resigned from the Pacific Gas & Electric Company, which recently took over the Great Western company, to become affiliated with the Electric Bond & Share Company, New York City. Prior to his appointment as assistant to the vice-president and general manager, Mr. Sharon had been for two years assistant sales manager for the Great Western Power Company. To take that position he had resigned as city sales superintendent for the Standard Oil Company in Bakersfield, Calif. He had joined the sales force of the Standard Oil Company in Portland, Ore., following his discharge from the service in the World War. Later he became service station superintendent at Seattle, Wash., for that company and then held a similar position in Sacramento, Calif. Mr. Sharon was graduated from Yale University in 1912 with a degree in electrical engineering and then entered the employ of the City Electric Company, San Francisco, as an industrial power salesman.

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### *S. T. MacQuarrie Assumes New Duties in Boston*

SAMUEL T. MACQUARRIE has been appointed head of the publicity department of the public relations bureau of the

Edison Electric Illuminating Company of Boston, following seven years' service as director of the New England Bureau of Public Service Information. The New England bureau has been discontinued in favor of the policy of handling publicity by individual companies direct from their headquarters offices. Mr. MacQuarrie's previous experience includes about twenty years with the Fore River Shipbuilding Company at Quincy, Mass., and during the World War he was office manager of the latter company's destroyer plant at Squantum. He has been chairman of the committees on public speaking and public relations in the New England Division of the National Electric Light Association.

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G. M. EVANS, formerly works manager of the Kelvinator Corporation, Detroit, has been advanced to the position of vice-president in charge of manufacturing. Prior to joining Kelvinator he had been associated with the General Electric Company at Schenectady, N. Y.; consulting engineer with the Fuel Engineering Company, New York; general manager for the Budd Wheel Corporation, and superintendent of planning for the Chrysler Corporation, Detroit.

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A. H. ARMSTRONG, assistant engineer of the railway department of the General Electric Company for many years, and more recently chairman of the railroad electrification committee, and consulting engineer for the transportation department, has established a private consulting engineering office at Schenectady, N. Y. Mr. Armstrong was graduated from Worcester Polytechnic Institute in 1891, and entered the employ of the Thomson-Houston Company at Lynn, Mass., in the same year. He joined the railway engineering department of the General Electric Company in 1897, and since that time has devoted most of his energies to the study of railroad problems. He is a member of the American Institute of Electrical Engineers, American Electric Railway Association, American Railway Engineering Association and other societies, and has been active in the National Electric Light Association. Mr. Armstrong retired from the General Electric Company on November 1 to take up immediately his private consulting engineering work.

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## OBITUARY

JAMES HAGERMAN, JR., a member of the consulting engineering firm of Roper, Hagerman, Hurrey & Dudley, Washington, D. C., died October 11.

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FRANK ALLISON DAVIS, chairman of the board of directors of the Scioto Valley Railway & Power Company and a member of the board of directors of the Huntington National Bank, Columbus, Ohio, died at his home in that city, October 24. He was 72 years of age.

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GEORGE B. GRANT, for the past twelve years publicity representative of the Lynn Works of the General Electric Company, died of heart failure, October 25, in Maine. He was 62 years of age and was widely known in the newspaper and electrical fields in eastern New England.

# Financial and Statistical News

CURRENT earnings statements of power and light companies show gross revenues around 3 per cent, on the average, over last year's, against declines in nearly all other branches of industry. Intensive appliance merchandising campaigns are contributing to the increase.

——A REPRESENTATIVE GROUP OF UTILITY COMMON STOCKS now sells at 18 times earnings, against 34 times earnings at the beginning of October last year. European interest in these stocks is said to be reviving substantially.

——EXTRA STOCK DIVIDENDS to be announced toward the end of the year are being again rumored.

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## A Third of New England Farms Electrified

ACCORDING TO THE LATEST statistics available, the six New England states—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut—have increased their saturation of rural electric service from 9.75 per cent in January, 1924, to 34.7 as of June 30, 1930. On the latter date there were 43,411 farms receiving electric service, compared with 15,522 on January 1, 1924. The apparent discrepancy in percentage electrified is due to the decrease in the total number of farms during the intervening period.

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## New Management Company Recently Organized

ALLIED WATER & UTILITIES CORPORATION has been organized to engineer, finance and manage public utilities. Its offices will be in New York City. The board of directors includes Herbert N. Bradley, William C. Canfield, L. Edward Herrmann, D. R. McLain, A. W. Porter, Frederick S. Stoepel, Edward L. Stokes, E. Rogers Underwood and Kenneth T. Young.

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## New Capital Issues

FIRST MORTGAGE 3¾ per cent gold bonds of the New York State Electric & Gas Corporation have been offered to the amount of $6,700,000 at 99¾ and accrued interest. These securities, dated November 2, 1930, will mature November 1, 1931. Proceeds from the sale will be used to repay indebtedness incurred for additions to properties. The company is one of the most important units in the Associated Gas & Electric System. It owns and operates principally electric properties in western south central and eastern New York State, serving 390 communities having an estimated population of 550,000.

American Community Power Company made an offering of one-year 5½ per cent secured gold notes, amounting to $1,800,000, the price being 99½ and interest, to yield about 6 per cent. This company, organized in 1928 under the laws of the state of Delaware, owns all of the outstanding common stock of Community Power & Light Company and over 99.9 per cent of the outstanding common stock of the General Public Utilities Company.

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## German Plants Are 28.7 per Cent Hydro

OF GERMANY'S 12,416,073 kw. in central stations at the end of 1929, 3,564,081 kw., or 28.7 per cent, was waterpower. Two fifths of the total was in plants owned by private corporations, while three-fifths was in publicly owned establishments. The allocation is shown in the following table:

| Ownership | Total Kw. | Hydro Kw. | Per Cent Hydro |
|---|---|---|---|
| Private | 4,921,337 | 1,278,768 | 26.0 |
| Public | 7,494,736 | 2,285,313 | 30.5 |
| Total | 12,416,073 | 3,564,081 | 28.7 |

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# Stock and Merchandise Campaign Takes Care of Rate Reductions

A COMBINED merchandise and preferred stock campaign, wider in scope and greater in results than any similar activity in the history of the organization, was completed on October 17 by the Virginia Public Service Company, a subsidiary of the National Electric Power Company and a part of the Middle West Utilities System. Known as the "Seven 7's Campaign," the project marked the first the company had ever carried on throughout all of its five divisions at once.

Starting August 7, the company set out to sell 700 electric ranges, 700 electric refrigerators, 700 electric water heaters and 7,000 shares of its 6 per cent preferred stock in the 70 days ended October 17. The final results were 114 per cent of the aggregate quota, 111 per cent of the merchandise quota and 122.9 per cent of the preferred stock quota, the total sales being 1,421 ranges, 701 refrigerators, 209 water heaters and 8,605 shares of preferred stock. The 114 per cent of the aggregate quota was arrived at by grouping the preferred stock quota and sales into units of ten shares each in order to bring them into balance with the merchandise items. The low standing in water heater sales is attributable mainly to the fact that the electric water heater is a new appliance in this company's territory.

Prior to the opening of the campaign the water heater had been on the company's list of appliances for so short a time that sufficient preliminary educational work on this appliance could not be done. It was natural, therefore, that sales during the campaign should follow the popular appeal of the known appliances, the range and refrigerator. Officials of the company stated, however, that their experience with the electric water heater during the campaign indicated strongly that the company's territory is a fertile field for this appliance. Plans are now being perfected to push its sale more strongly in the future.

One of the primary motives for the campaign was the recovery, in so far as possible, of a loss in gross income brought about by a general reduction in the company's rates effected during August and amounting to about $500,000 per year. Another was the increase of the company's field of service—the education of its customers to knowledge of the fact that increased usage of electricity brings lower rates—so that the policy of rate reduction can be continued in the future as rapidly as is consistent with the safety of the company's inter-

ests and those of its customers. Another motive was the increase in kilowatt-hour consumption throughout its territory by means of the wider distribution and sale of these major appliances.

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## Utility Companies Call Securities for Payment

AMERICAN PUBLIC UTILITIES COMPANY has called for redemption November 15 at 110 and dividends all of the outstanding prior preferred stock and at 105 and dividends all of the outstanding participating preferred stock.

Ohio River Edison Company will redeem its first mortgage sinking fund gold bonds, 5 per cent series of 1926, and first mortgage sinking fund gold bonds, 6 per cent series of 1923, on December 1, 1930, and January 1, 1931, respectively.

All of the outstanding fifteen-year 6 per cent gold debentures of the Pennsylvania-Ohio Power & Light Company, due July 1, 1939, were called for redemption September 1 at 103 and interest.

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## Extra Dividends

DIRECTORS OF THE Western Power, Light & Telephone Company, Salina, Kan., have declared an extra dividend of 6¼ cents per share in addition to the regular quarterly dividend of 50 cents per share on the participating class A stock, no par value, both payable November 1 to holders of record October 15.

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Weymouth Light & Power Company, East Weymouth, Mass., has declared an extra dividend of 2 per cent in addition to the regular quarterly dividend of 2½ per cent on the capital stock, par $25, both payable November 1 to holders of record October 15.

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Directors of the Ingersoll-Rand Company declared an extra dividend of $1 per share and the regular quarterly dividend of $1 per share on the common stock, no par value, both payable December 1 to holders of record November 3. A similar distribution was made June 2 and December 2, 1929.

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Directors of the Southern Berkshire Power & Electric Company have declared an extra dividend of $1.25 per share and the regular quarterly dividend of 75 cents per share, both payable October 10 to holders of record September 15.

# NEWS BRIEFS

Directors of the Brazilian Traction, Light & Power Company, Ltd., have declared a 2 per cent stock dividend on the ordinary stock, payable on or about December 1 to holders of record October 31. Previously, the company paid quarterly dividends of 50 cents per share in cash, and, in addition, on March 1, 1930, made a 1 per cent stock distribution.

•

American Brown Boveri Electric Corporation and subsidiaries report for nine months ended September 30, 1930, consolidated profit of $48,234 after interest, depreciation and other charges, but before federal taxes. This compares with profit of $560,618 before federal taxes in first nine months of previous year.

•

Northern New York Utilities, Inc., will pay off on December 15, 1930, first lien and refunding 6 per cent gold bonds, series C, to the amount of $13,700 at 105 and interest. These bonds were due May 1, 1943.

The Canada Northern Power Corporation, Ltd., has just concluded a successful customer-ownership sale. An offering of 5,000 shares of the company's 7 per cent cumulative preferred stock was made to the company's customers, and before the sale was closed 1,762 customers subscribed for 5,059 shares.

•

The following were added to the list of investments considered legal for savings banks and trust funds in the State of Massachusetts: Narragansett Electric Company first mortgage 5s, 1957; New Jersey Power & Light Company first mortgage 4½s, 1960, and Pacific Gas & Electric Company series F, first and refunding mortgage 4½s, 1960.

•

Link-Belt Company reports for the nine months ended September 30 net profits, after depreciation, federal taxes and other charges, of $1,802,111, equal after preferred dividends to $2.26 a share on the common stock, as compared with $2,431,322, or $3.15 a share, for the similar period of last year.

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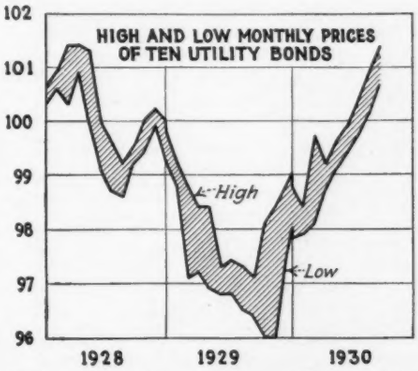
# Stock and Bond Prices Near 1928 Levels

STEADY selling pressure which continued virtually all through October clipped another half-billion dollars from the aggregate prices of eighteen representative power and light stocks listed on the New York Stock Exchange. The utilities shared the downward movement of all groups, although still selling at a somewhat higher ratio in relation to per share earnings than other groups.




**Prices of representative utility bonds are near 1928 levels**

This brings utility stock prices back to 1928 levels. According to compilations made by the New York *Times* 29 representative utility issues listed on the New York Stock Exchange declined $1,635,000,000 since August 31, 1930, and $5,825,000,000 since August 31, 1929. Changes in market value of the same group of stocks as compiled by the same source are illuminating:

| From | To Oct. 31, 1930 |
|---|---|
| Aug. 31, 1930, a decline of | $1,635,000,000 |
| Dec. 31, 1929, a decline of | 1,420,000,000 |
| Nov 30, 1929, a decline of | 1,084,000,000 |
| Oct. 31, 1929, a decline of | 2,364,000 000 |
| Sep. 30, 1929, a decline of | 5,767,000,000 |
| Aug. 31, 1929, a decline of | 5,825,000,000 |
| May 31, 1929, a decline of | 1,784,000,000 |
| Dec. 31, 1928, a decline of | 943,000,000 |
| Oct. 31, 1928, a gain of | 56,000 000 |
| Sep. 30, 1928, a decline of | 19,000,000 |
| May 31, 1928, a decline of | 131,000,000 |
| Apr. 30, 1928, a gain of | 119,000,000 |
| Oct. 31, 1927, a gain of | 1,083,000,000 |
| Apr. 30, 1927, a gain of | 1,526,000,000 |

It is evident from the attached summary that present prices correspond to those in the spring of 1928. A decline in October, 1928, however, brought prices down to another point which corresponds roughly to present levels. Since that time the effect of a year of rising prices has been canceled by a year of declining prices.

Similarly, although with converse movement, the prices of public utility bonds have recovered to a point corresponding with that of the bond price average in the spring of 1928. The attached graph shows the range of a representative group of utility bonds. While the decline from the spring of 1928 on was closely related to the heavy accumulation of common stocks and the consequent diversion of capital from the bond market, the crash in stock prices was the low point of bond

prices. The latter, however, have continued upward rather than downward since that time.

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## Nearly 11 per Cent Growth in Portugal

SEVENTY-TWO HYDRO-ELECTRIC power stations, with a total capacity of 36,008 kw., and 316 fuel-operated plants, aggregating 108,216 kw., were in operation in Portugal at the commencement of the present year, according to the *Revista* of the Portuguese Association of Civil Engineers. Of the total of 388 generating stations, 237 have a capacity of not more than 100 kw., 117 stations range between 100 kw. and 500 kw., 16 between 500 kw. and 1,000 kw. and 13 between 1,000 kw. and 5,000 kw., there being only five large stations, totaling 66,376 kw. The total power output during 1929 amounted to 240,425,707 kw.-hr., an increase of 10.86 per cent over 1928. Lisbon is the largest power using center, the sales in that area last year amounting to 67,891,255 kw.-hr., or 128 kw.-hr. per inhabitant. The second most important center is Oporto, with a total of 36,956,401 kw.-hr., or 171.3 kw.-hr. per inhabitant.

Corresponding statistics for the preceding year, 1928, appeared in the ELECTRICAL WORLD of February 1 and 8, 1930, on pages 269 and 315. Comparison reveals an increase of two in the number of hydro plants and 2,374 kw., or 7 per cent, in their aggregate rating; fuel-operated plants increased in number by 31 and in rating by 6,128 kw., or 6 per cent. Lisbon increased 5 per cent in energy sales, Oporto 16 per cent.

## Australia's Growing Use of Electricity

PRELIMINARY FIGURES relating to the operations of the State Electricity Commission of Victoria, Australia, show that for the year ended June 30 last the total revenue was £1,904,071 (about $9,250,000) and the total expenditure—which includes all interest, sinking fund and depreciation charges—£1,899,705 (about $9,230,000), the corresponding figures for 1928-29 being £1,702,253 ($8,270,000) and £1,697,639 ($8,245,000) respectively. The year's profit was £4,614 ($22,000) on all activities, which comprise electricity supply and briquetting.

Although the general depression which manifested itself in the present year had become more marked as time went on and had reached an acute stage in the

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## CURRENT EARNINGS REPORTS OF ELECTRIC LIGHT AND POWER COMPANIES

| | 1930 | 1929 | Per Cent Increase | Operating Ratio 1930 | Operating Ratio 1929 |
|---|---|---|---|---|---|
| **Alabama Power & Subs.** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | $17,972,897 | $18,270,266 | —1.6 | 42 | 38 |
| Net earnings | 10,385,193 | 11,355,415 | —8.5 | .. | .. |
| **American Commonwealths Power and affiliated companies** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 22,987,488 | 27,675,679 | —17.0 | 57 | 53 |
| Net earnings | 9,924,118 | 12,944,831 | —23.4 | .. | .. |
| **American Water Works and Electric & Subs.** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 55,096,974 | 52,883,285 | 4.2 | 50 | 50 |
| Net earnings | 27,404,560 | 26,171,612 | 4.7 | .. | .. |
| **Arkansas Power & Light** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 8,969,180 | 7,995,957 | 12.0 | 53 | 52 |
| Net earnings | 4,197,959 | 3,885,521 | 8.0 | .. | .. |
| **Associated Gas & Electric System** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 110,114,628 | 75,406,500 | 46.0 | 51 | 53 |
| Net earnings | 53,926,775 | 35,636,473 | 51.0 | .. | .. |
| **Carolina Power & Light** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 8,921,008 | 9,310,815 | —4.0 | 44 | 46 |
| Net earnings | 4,952,759 | 5,071,152 | —2.0 | .. | .. |
| **Cities Service** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 60,266,054 | 40,762,166 | 48.0 | .. | .. |
| Net earnings | 58,130,187 | 39,514,552 | 47.0 | .. | .. |
| **Consumers Power** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 32,819,321 | 33,161,727 | —1.4 | 46 | 49 |
| Net earnings | 17,601,947 | 16,843,510 | 4.5 | .. | .. |
| **Dallas Power & Light** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 5,262,589 | 5,086,682 | 3.0 | 47 | 45 |
| Net earnings | 2,489,541 | 2,307,352 | 0.0 | .. | .. |
| **Detroit Edison** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 54,710,285 | 56,272,787 | —2.8 | 68 | 65 |
| Net earnings | 17,567,482 | 19,339,288 | —9.2 | .. | .. |
| **Federal Light & Traction** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 8,510,247 | 8,344,747 | 2.0 | 57 | 59 |
| Net earnings | 3,660,187 | 3,416,449 | 7.1 | .. | .. |
| **Georgia Power & Subs.** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 24,038,838 | 24,001,145 | 0.1 | 50 | 47 |
| Net earnings | 12,171,264 | 12,742,340 | —4.5 | .. | .. |
| **Houston Lighting & Power** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 8,683,799 | 7,685,404 | 13.0 | 52 | 54 |
| Net earnings | 4,189,655 | 3,563,593 | 18.0 | .. | .. |
| **Idaho Power** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 4,080,004 | 3,695,078 | 10.0 | 49 | 48 |
| Net earnings | 2,084,365 | 1,928,356 | 8.0 | .. | .. |
| **Kansas City Power & Light** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 14,688,074 | 14,449,413 | 1.6 | 49 | 51 |
| Net earnings | 7,491,845 | 7,099,176 | 5.5 | .. | .. |
| **Kansas Gas & Electric** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 6,066,836 | 5,638,504 | 8.0 | 53 | 53 |
| Net earnings | 2,860,086 | 2,664,444 | 7.0 | .. | .. |
| **Los Angeles Gas & Electric** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 23,610,976 | 24,072,834 | —1.9 | 55 | 53 |
| Net earnings | 10,557,944 | 11,458,636 | —7.9 | .. | .. |
| **Louisville Gas & Electric** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 10,488,991 | 10,093,167 | 3.9 | .. | .. |
| Net earnings | 5,373,543 | 5,212,028 | 3.1 | .. | .. |
| **Memphis Power & Light** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 6,719,169 | 5,984,973 | 12.0 | 59 | 60 |
| Net earnings | 2,730,364 | 2,409,359 | 13.0 | .. | .. |
| **Minnesota Power & Light** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 6,440,783 | 6,195,605 | 4.0 | 39 | 35 |
| Net earnings | 3,941,529 | 4,010,312 | —2.0 | .. | .. |
| **Nebraska Power** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 6,412,943 | 5,781,054 | 11.0 | 49 | 51 |
| Net earnings | 3,233,585 | 2,833,694 | 14.0 | .. | .. |
| **Nevada-California Electric & Subs.** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 5,638,722 | 5,589,085 | 0.9 | 48 | 48 |
| Net earnings | 2,902,023 | 2,924,378 | —0.8 | .. | .. |
| **North American & Subs.** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | *140,296,108 | 145,624,061 | —3.7 | 52 | 52 |
| Net earnings | 67,456,075 | 69,777,334 | —3.3 | .. | .. |
| **Northern States Power** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 33,151,857 | 32,334,719 | 2.5 | .. | .. |
| Net earnings | 16,506,552 | 16,710,035 | —1.2 | .. | .. |
| **Oklahoma Gas & Electric** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 14,791,940 | 13,575,669 | 0.9 | .. | .. |
| Net earnings | 6,960,077 | 6,471,256 | 7.5 | .. | .. |
| **Pennsylvania Power & Light** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 30,842,410 | 29,851,077 | 3.0 | 49 | 50 |
| Net earnings | 15,624,805 | 14,808,099 | 6.0 | .. | .. |
| **Philadelphia Company** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 62,677,376 | 62,920,495 | —0.4 | .. | .. |
| Net earnings | 30,626,737 | 30,523,475 | 0.3 | .. | .. |
| **Public Service of New Jersey** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 138,734,703 | 134,078,720 | 3.5 | 69 | 69 |
| Net earnings† | 42,734,354 | 40,758,377 | 4.8 | .. | .. |
| **Southern California Edison** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 41,172,721 | 38,975,932 | 6.0 | 33 | 33 |
| Net earnings | 27,590,238 | 25,941,686 | 6.0 | .. | .. |
| **Standard Gas & Electric & Subs.** | | | | | |
| (Year ended August 31) | | | | | |
| Gross earnings | 154,809,694 | 151,844,758 | 2.0 | .. | .. |
| Net earnings | 74,164,334 | 72,625,169 | 2.1 | .. | .. |
| **Tennessee Electric Power & Subs.** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 15,226,356 | 14,262,572 | 6.7 | 52 | 51 |
| Net earnings | 7,352,990 | 6,953,330 | 5.7 | .. | .. |
| **United Gas Improvements & Subs.** | | | | | |
| (Year ended September 30) | | | | | |
| Gross earnings | 108,450,324 | 102,931,297 | 5.4 | 58 | 61 |
| Net earnings | 45,704,536 | 40,702,039 | 12.2 | .. | .. |

*Excludes gross earnings, operating expenses and all other details of income accounts of California subsidiaries from June 12, 1930, to September 30, 1930.

†Operating expenses include maintenance, taxes and depreciation.

period just ended, the commission's estimate of growth and demand were not affected until June, when sales of energy showed a lower increase than was anticipated. A similar condition was experienced in July, and was likely to make itself felt for some time to come. The energy sold during the year was 39,633,493 kw.-hr. more than in the preceding year, the total being 396,227,217 kw.-hr., as compared with 358,177,047 kw.-hr. in 1928-29. The maximum demand on the system was 97,200 kw., an increase for the year of 6,200 kw. Although stringency of loan funds had postponed many rural extensions, eight new centers were connected to the system, the total number now receiving transmitted supply being 149.

The energy ouput of Victoria constitutes between 20 and 25 per cent of that for the whole of Australia, it is estimated from the incomplete figures available.

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## British Output Increases 10.3 per Cent

OFFICIAL RETURNS JUST ISSUED by the British Electricity Commission show that 833,000,000 kw.-hr. were generated by authorized undertakers in Britain during September, as compared with 755,000,000 kw.-hr. in the corresponding month of 1929. The increase is 10.3 per cent. For the first nine months of 1930 the total was 7,721,000,000 kw.-hr., an increase of about 5.9 per cent compared with the corresponding period of 1929.

The scheme for the intensive electrification of rural areas, adopted by the Central Electricity Board in conjunction with the Electricity Commission, and already announced for areas near Bedford and Norwich, is to be carried a step further by the electrification of a similar area near Shrewsbury, of 108 square miles and with a population of approximately 14,000—124 per square mile. The number of homes is 2,718.

The supply is to be made as attractive and accessible to potential consumers as possible, among others by a scheme of assisted wiring, so that new consumers will not be forced to make a large cash payment for connection to the supply system, and the provision of a service whereby electrical cooking and heating apparatus and electric motors are to be rented or purchased on time and efficiently maintained at low cost.

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## Peru's Stations Are Small

ONLY FIVE CENTRAL light and power plants in Peru exceed 1,000 kw. in rating, according to special circular No. 557, recently issued by the Electrical Equipment Division of the Department of Commerce. This is a revision of a circular bearing the same number, issued last June.

Altogether, 63 plants are listed; the largest, of 20,800 kw., is in Lima. The large plants are generally hydro-electric, while most of the small ones use oil engines. More than half are of less than 100 kw. capacity. Operation at 220 volts and 60 cycles predominates; a few plants run at 50 cycles.

The Edison screw socket is used exclusively in Peru. In the miniature and candelabra sockets the German, French and American types are used. About 50 per cent of the attachment plugs and caps are of the standard American type, while the remainder are of the pin type, conforming to German standards.

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## Norway's Electrical Advance Notable

LIKE EVERY OTHER MEMBER of the family of nations, Norway is annually increasing her installation of electric public utility equipment. For the five-year period ended January, 1928, the growth in station capacity was 47 per cent.

A booklet, "Technical and Economic Survey," issued by that country's Water Course and Electricity Service presents statistics from which the accompanying table has been abstracted. For the year 1927, the latest included, it gives the output as 8,700,000,000 kw.-hr., or 3,100 kw.-hr. per capita. Of this about 6,500,000,000 kw.-hr. is stated to be used for electrochemical, electrothermal and transportation purposes.

### *Electric Public Utility Industry in Norway*

| | June, 1921 | January, 1923 | January, 1924 | January, 1925 | January, 1926 | January, 1927 | January, 1928 |
|---|---|---|---|---|---|---|---|
| Total power plant rating, kw | 300,000 | 320,000 | 325,000 | 340,000 | 410,000 | 445,000 | 470,000 |
| Water-power, kw | 275,000 | 295,000 | 300,000 | 315,000 | 385,000 | 425,000 | 450,000 |
| Steam and oil, kw | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 | 20,000 | 20,000 |
| Capacity, including leased, kw | 330,000 | 380,000 | 410,000 | 425,000 | 475,000 | 500,000 | 515,000 |
| Transformer rating, kva | 390,000 | 470,000 | 550,000 | 580,000 | 625,000 | 663,000 | 685,000 |
| Invested capital, millions of kr.* | 510 | 630 | 700 | 750 | 870 | 912.5 | 934 |
| Power-plant investment per kw., kr.* | 800 | 780 | 800 | 800 | 820 | 845 | 805 |
| Transmission and distribution investment per transformer kva., kr.* | 540 | 660 | 660 | 670 | 670 | 612 | 592 |

NOTE—In 1923-1928 are included some statistics for the year closing the preceding June.
*One Krone—$0.27 approximately.

## Lower Prices Increase Domestic Use

IN THE DOMESTIC FIELD particularly the effect of lower prices for electricity has been remarkable. From January 1, 1928, to the end of July this year the average sales price of electric service to domestic users has declined from 6.55 cents to 6.04 cents a kilowatt-hour, or 8½ per cent. In the current year it has dropped 2.3 per cent. From January 1, 1928, to the end of July of this year the average of domestic consumption has risen from 459 kw.-hr. a year to 531 kw.-hr., or 15 per cent. In the current year it has increased 5.8 per cent. In 1912 sales of domestic service amounted to 8 per cent of the total sales and yielded 26 per cent of the total revenues. This year sales to homes will amount to 15 per cent of the total sales and will yield 33 per cent of the revenue. —M. S. SLOAN, *in an address before the seventh Conference of Major Industries, Chicago, October 22.*

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## Southern California Edison Earnings Up

NOTWITHSTANDING AN INCREASE IN TAXES of $345,000 and the additional common stock issued through stockholders' rights, the earnings per share on Southern California Edison Company, Ltd., common for 1930 will equal last year's showing of $3.44 per share, according to the estimate of John B. Miller, chairman of the company. Gross revenues at the voluntary lower rates for 1930, Mr. Miller estimates, will be $41,800,000, an increase of 3½ per cent over 1929. Operating efficiencies have been maintained, with the result that net operating earnings will show an increase for the year of 5½ per cent. New business contracted this year compares favorably with the banner year of 1929 and shows a substantial increase over 1928. Estimate of new business contracted for in 1930, based on ten months' actual figures, is 335,000 hp. This compares with 364,000 hp. for 1929 and 293,000 hp. for 1928. Energy consumption per horsepower has been a little below normal this year. This, however, has been more than covered by the new business connected, and Edison will start the year 1931 with a highly diversified connected load of more than 2,500,000 hp. and will add 25,000 new consumers during the year 1930.

The amount remaining for dividends and depreciation, after fixed charges, was $15,394,853 in 1930, compared with $15,253,222, bringing the balance for the year to date $141,631 above last year.

# Business News and Markets

## Insull Companies Assist in Unemployment Relief

EMPLOYEES AND OFFICERS of the Insull group of public utility companies will contribute one day's pay a month for six months to the relief of distress caused by unemployment, according to a statement made by Samuel Insull. Contributions, which will be entirely voluntary, will be collected by committees in each Insull company and distributed through recognized relief agencies.

Britton I. Budd and Samuel Insull, Jr., were among the chairmen named to deal with the various phases of relief by George F. Getz, chairman of Gov. Louis L. Emmerson's commission on employment and relief.

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## New England Power Boosts Appliance Sales

TOTAL VALUE of domestic appliance sales in September by retail units of the New England Power Association, a subsidiary of the International Paper & Power Company, was $163,547, an increase of 12.5 per cent over August. In the first nine months of this year sales amounted to $1,666,352, or 23.2 per cent over the corresponding period of last year. These substantial increases in sales this year are remarkable in view of the fact that general business conditions last year were at a much higher level.

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## Wiring Work in New York Often Below Standard

ONE MILLION DOLLARS A YEAR penalty in increased insurance premiums is being paid by property owners of New York City because of hazardous electrical wiring conditions, according to a statement by the Electrical Association of New York. This is due, the association holds, in large part to the fact that an abnormal amount of wiring is being done by irresponsible contractors who pay little regard to standards of either safety or adequacy, licenses having been issued in great numbers to unqualified men who desire to take on wiring jobs while out of work or in their spare time. The number of violations on wiring jobs and the number of fires of electrical origin have been growing.

These facts have come to light as the result of a study recently completed by the association. A proposed twelve months' campaign is now announced to correct the conditions, the plan being to expose them to those responsible for building construction in New York and to the general public and to take action toward a more effective administration of the license law.

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## Electric Machinery Order

THE ELECTRIC MACHINERY MANUFACTURING COMPANY of Minneapolis recently received from the Atlantic Ice & Coal Company of Atlanta an order for fourteen "E-M" synchronous motors, control equipment and excitation equipment. These motors are to be installed at the Atlanta, Augusta, Cordele, Jacksonville and Macon plants of the Atlantic Ice & Coal Company and will be used in driving ammonia compressors. All the motors will operate at unity power factor.

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## N.E.M.A. Officers

OFFICERS OF THE National Electrical Manufacturers' Association include Clarence L. Collens, president, and R. H. Goodwillie, treasurer.

Vice-presidents are C. H. Strawbridge, S. L. Nicholson, D. R. Bullen, W. E. Sprackling and F. R. Fishback, who is newly elected to office.

On the executive committee are Clarence L. Collens, R. H. Goodwillie, I. A. Bennett, D. R. Bullen, H. B. Crouse, F. R. Fishback, H. J. Mauger, D. H. Murphy, S. L. Nicholson, W. E. Sprackling and C. H. Strawbridge, as well as C. A. Bates, Wylie Brown, A. L. Lindemann and Louis Ruthenburg, who are newly elected to office.

Board of governors consists of the executive committee plus the following: Louis Allis and F. A. Merrick and five newly elected officers, including L. C. Nichols, W. D. Steele, L. G. Sylvester, G. A. Waters and F. T. Wheeler.

Arthur W. Berresford is managing director and Francis E. Neagle counsel.

## Fuel System Standard Revision Announced

A REVISION OF THE American Standard "Safety Code for the Installation of Pulverized-Fuel Systems" is announced by the American Standards Association. The rapid increase in the use of pulverized fuel in many industries, resulting in new developments in methods and design of equipment, is responsible for the revision. The original code was approved by the American Standards Association in 1927.

The code covers the construction of buildings housing fuel-pulverizing equipment, the ventilation of these buildings and specifications for dust-collection systems. Specifications are given covering methods of preventing explosions through static, through the drying of coal and through its transportation by means of pipe lines. The code also contains suggestions for safe operating rules to be printed on instruction cards which can be used for the guidance of the employees in charge of operation.

The standard, which is part of a comprehensive project for the prevention of dust explosions, was developed, and the revision undertaken, under the sponsorship of the National Fire Protection Association and the United States Department of Agriculture.

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## Northern Illinois Utility Starting 1931 Projects

WORK WILL BE STARTED immediately on about $1,000,000 worth of 1931 construction projects of the Public Service Company of Northern Illinois, according to an announcement this week from the company's general offices in Chicago. Contracts for some of the work have just been let, and other construction jobs of varying size will be started soon in several locations outside Chicago. "About half the additional expenditure will go as actual wages," said Julius L. Hecht, vice-president of the company, "and we hope the pushing ahead of these projects will represent a contribution toward relief of unemployment."

The work contemplated is distinctly in addition to projects previously started during this year. Work will continue

to go forward on the installation of a fifth unit at the Waukegan generating station costing approximately $14,000,000 and on the erection of a service headquarters, to cost $750,000, west of Glencoe.

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# TRADE BRIEFS

The Refrigeration Engineering Department of the Westinghouse Electric & Manufacturing Company will be moved from Mansfield, Ohio, to Springfield, Mass., according to an announcement made by M. C. Terry, manager.

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Ohio Brass Company announces that Ezra H. Day has been appointed to its sales staff. Mr. Day has had a broad background of experience in the electrical industry, having been associated in the course of his career with such companies as Leeds & Northrup, Packard Electric, Standard Underground Cable and General Cable Corporation. Working out of the Philadelphia office, where his headquarters have been established, Mr. Day will cover one of the eastern power company territories.

•

Hoskins Manufacturing Company, Detroit, manufacturer of resistance wire, electric furnaces and pyrometers, announced the appointment of E. A. Wilcox as representative in California with headquarters in San Francisco.

•

Western Electric Company has shortened hours of operation at certain locations in order to keep the maximum number of trained employees at work, according to a statement made by Edgar S. Bloom, president.

•

The Lincoln Electric Company, Cleveland, announces the appointment of W. S. Stewart, formerly in charge of Pacific Coast offices, as district manager in charge of the Cleveland territory.

## Copper in Demand at Present Level

THE 9½-CENT PRICE FOR COPPER continues to be attractive to all classes of consumers, both here and abroad, and they booked orders for all that the consumers were willing to sell, totaling, in the domestic market, about 31,000 tons, and for export (through the association) about 30,000 tons. The combined total represents probably the best week's business since early July, when the drop to 11 cents stimulated an even greater demand. In the domestic market deliveries varied from prompt to March, with the largest demand for January and February.

| | Oct. 29, 1930 Cents per Pound | Nov. 4, 1930 Cents per Pound |
|---|---|---|
| Copper, electrolytic | 9½ | 9½ |
| Lead, Am. S. & R. price | 5.10 | 5.10 |
| Antimony | 7¼ | 7¼ |
| Nickel, ingot | 35 | 35 |
| Zinc, spots | 4.35 | 4.75 |
| Tin, straits | 27 | 25 60 |
| Aluminum, 99 per cent. | 23.30 | 23.30 |

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## EXPORTS OF ELECTRICAL EQUIPMENT (PRELIMINARY)

| Article | September 1929 | September 1930 |
|---|---|---|
| **Generators:** | | |
| Direct current— | | |
| Under 500 kw | $112,502 | $48,609 |
| 500 kw. and over | 42,516 | 49,113 |
| Alternating current— | | |
| Under 2,000 kva. | 35,496 | 22,959 |
| 2,000 kva. and over | 129,349 | 64,051 |
| Steam turbine generator sets | 39,336 | 53,558 |
| Accessories and parts for generators | 115,125 | 53,022 |
| Arc welding sets | ..... | 17,130 |
| Self-contained lighting outfits | 106,535 | 72,298 |
| **Batteries:** | | |
| Storage batteries | 320,111 | ..... |
| 6-volt storage batteries | ..... | 184,208 |
| Other storage batteries | ..... | 114,897 |
| No. 6 dry cell batteries | ..... | 28,179 |
| Flashlight batteries | 239,830 | 303,436 |
| Radio B and C batteries (dry) | 110,397 | 37,773 |
| Other dry and wet cell primary batteries | 138,102 | 18,844 |
| **Transforming or converting apparatus:** | | |
| Power transformers, 500 kva. and over | 56,305 | 42,067 |
| Distribution transformers, less than 500 kva. | 104,380 | 94,392 |
| Instrument transformers | 3,033 | 21,950 |
| Other transformers | 187,571 | 43,305 |
| Complete battery chargers under 15 amp. | 21,386 | 9,034 |
| Rectifiers, double-current and motor generators, dynamotors, synchronous and other converters | 69,699 | 57,937 |
| **Transmission and distribution apparatus:** | | |
| Switchboard panels, except telephone | 77,949 | 372,476 |
| Switches and circuit breakers over 10 amp. | 225,743 | 157,259 |
| Fuses | 47,888 | 32,849 |
| Watt-hour and other measuring meters | 79,133 | 59,188 |
| Electrical indicing instruments | 71,203 | 57,221 |
| Electrical recording instruments | 22,771 | 28,793 |
| Other electrical testing apparatus | 75,259 | 64,667 |
| Lightning arresters, choke coils, reactors and other protective devices | 101,463 | 70,045 |
| **Motors, starters, and controllers:** | | |
| Motors, ¼ hp. and under | $222,587 | $174,928 |
| Motors, over ¼ and under 1 hp | 57,022 | 46,639 |
| Stationary motors— | | |
| 1 to 200 hp | 330,204 | 232,202 |
| Over 200 hp | 51,174 | 28,966 |
| Railway motors | 2,048 | 14,250 |
| Electric locomotives— | | |
| Railway | ..... | 108,638 |
| Mining and industrial | 42,212 | 20,536 |
| Station and warehouse electric motor trucks | 7,783 | 11,261 |
| Starting and controlling equipment— | | |
| For industrial motors | 143,622 | 115,787 |
| For electric railway and vehicle motors | 8,389 | 24,743 |
| Portable electric tools | 90,389 | 90,184 |
| Accessories and parts for motors | 287,212 | 179,514 |
| Refrigeration sets up to ¼ ton capacity | 660,038 | ..... |
| Refrigeration sets over ¼ to 1 ton capacity | 182,221 | ..... |
| Electric household refrigerators | ..... | 357,640 |
| Electric commercial refrigerators up to 1 ton | ..... | 94,316 |
| Thermodynamic refrigerators | ..... | ..... |
| **Electric appliances:** | | |
| Electric fans | 102,116 | 22,422 |
| Electromechanical health exercisers | ..... | L 7,339 |
| **Electric incandescent light bulbs—** | | |
| Metal filament | 126,041 | ..... |
| For automobiles, flashlights, and Christmas trees | ..... | 15,064 |
| Other metal filament bulbs | ..... | 78,780 |
| Other electric lamp bulbs | 41,259 | 11,054 |
| Flashlight cases | 193,283 | 86,763 |
| Searchlights and floodlights | 38,211 | 21,851 |
| **Motor-driven household devices—** | | |
| Electric household washing machines | 208,268 | 121,720 |
| Electric vacuum cleaners | 101,753 | 150,746 |
| Other motor-driven devices, except tools | 102,975 | 43,713 |
| Electric flatirons | 27,518 | 24,745 |
| Electric cooking ranges | 21,387 | 25,539 |
| Other domestic heating and cooking devices | 90,870 | 80,176 |
| Industrial electric furnaces and ovens | 70,289 | 32,549 |
| Therapeutic and x-ray apparatus | 148,699 | 136,207 |
| **Signal and communication devices:** | | |
| Radio Apparatus— | | |
| Transmitting tubes, sets and parts | $221,790 | $142,073 |
| Receiving sets | 1,211,719 | 1,024,893 |
| Radio receiving tubes | 149,190 | 167,982 |
| Radio receiving-set components | 514,492 | 413,842 |
| Loudspeakers | 224,474 | 164,868 |
| Other radio receiving set accessories | 306,171 | 144,806 |
| Telegraph apparatus | 79,943 | 37,935 |
| Telephone apparatus— | | |
| Telephone instruments | 58,311 | 33,242 |
| Telephone switchboards | 212,255 | 25,616 |
| Other telephone equipment | 341,906 | 269,934 |
| Bells, buzzers, annunciators, and alarms | 38,105 | 24,953 |
| **Other electric apparatus:** | | |
| Spark plugs | 156,958 | 111,346 |
| Other starting, lighting and ignition equipment | 155,649 | 66,164 |
| Insulating material | 117,652 | 62,836 |
| Metal conduit, outlet, and switch boxes | 130,310 | 64,035 |
| Sockets, outlets, fuse blocks, and lighting switches | 164,966 | 135,285 |
| Electric interior lighting fixtures | 197,651 | 256,467 |
| Electric street lighting fixtures | 41,856 | 40,376 |
| Other wiring supplies and line material | 131,465 | 117,927 |
| Other electrical apparatus, n. e. s. | 1,148,703 | 875,785 |
| Rubber and friction tape | 39,021 | 34,498 |
| Globes and shades for lighting fixtures | 65,567 | 46,917 |
| Glass electric insulators | 14,685 | 9,724 |
| Electrical porcelain: | | |
| For less than 6,600 volts | 98,041 | 71,767 |
| For 6,600 volts and over | 57,831 | 65,643 |
| Carbons and electrodes: | | |
| Electrodes for electric furnaces | 154,976 | 182,328 |
| Other carbon products | 81,794 | 68,871 |
| Insulated iron or steel wire and cable | 40,152 | 13,968 |
| Copper, bare wire | 348,687 | 229,440 |
| Insulated copper wire and cable | 461,876 | ..... |
| Rubber-covered wire | ..... | 70,205 |
| Weatherproof wire | ..... | 21,283 |
| Telephone cable | ..... | 7,321 |
| Other insulated copper wire | ..... | 184,001 |
| **Totals** | $12,857,848 | $9,723,853 |
| Nine mo. ended Sept. 30 | $108,594,249 | $100,596,064 |

# Market Conditions

EQUIPMENT orders have risen sharply on the Pacific Coast, showing a 15 per cent rise in October. Utilities and industrials are buying more actively. Specialty orders still lead Eastern business, while heavy railroad buying is anticipated.

——MIDDLE WEST BUSINESS BEGINS TO SHOW INDICATIONS of heavier forward buying.

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## PACIFIC COAST

—BUSINESS IS DEFINITELY *on the upgrade at last, with September sales showing about a 15 per cent increase over August, and October the same over September. Ordering is widespread, though still in cautious quantities.*

—AN ENCOURAGING FEATURE *is the increase of residence building. The radio season has been somewhat delayed by late arrival of some new models.*

Small motors and distribution transformers are moving better than for several weeks and though large jobs are scarce, about $400,000 worth of feeder and substation material will be bought before 1931, with the possibility that orders aggregating $1,000,000 for the new 50,000-kva. steam Fresno station will be placed this year. Special business includes $45,000 worth of Westinghouse feeder regulators for southern California, a 1,500-kva. General Electric oil transformer for the Taft oil field section, $30,000 worth of Westinghouse parts for rebuilding transformers in the central area and $5,000 worth of General Electric motors and controls to a waterwheel company of San Francisco. Hospital business is still good, including a $42,000 electric clock award for Los Angeles, fixtures and supplies for a San Francisco wing, a $40,000 power house for the University of California, and fixtures for the Agnew Insane Asylum addition. A $750,000 hotel is being planned for Las Vegas, which is something tangible in the great Boulder Dam project. First steps also are being made in the great $5,000,000 King's River Dam project. Particularly interesting is industrial progress in the Richmond and Pittsburg areas, near San Francisco, where $7,000,000 worth of construction is proceeding or planned, with the Ford and Shell plants as a nucleus.

Plans for the expenditure of approximately $125,000 in the construction of 13,000-volt transmission lines throughout the southern end of Whidby Island and a 1,000-kw. substation at Coupeville on the island are announced by Puget Sound Power & Light Company. This utility last week opened bids for furnishing approximately $40,000 worth of suspension type insulators to be used in transmission line work between the Rock Island project on the Columbia River and Puget Sound. Board of Contracts and Awards, Tacoma, awarded a contract to the Bailey Meter Company of Cleveland for a regulation board and instruments for combustion control for municipal steam auxiliary amounting to $27,374.

#### CONSTRUCTION PROJECTS

San Joaquin Light & Power Corporation, Fresno, Calif., has approved plans for steam-operated electric power plant to cost $4,600,000. Hammer Bray Company, Oakland, Calif., has completed plans for addition to gas stove manufacturing plant to cost $200,000. Pacific Gas & Electric Company, San Francisco, Calif., has plans for equipment and service buildings at San Mateo, Calif., to cost over $65,000. Cascade Utilities Company, Oakridge, Ore., contemplates hydro-electric power plant to cost about $80,000. Seattle Chain & Manufacturing Company, Seattle, Wash., has filed plans for plant at San Francisco, Calif., to cost close to $80,000. Pacific Coast Elevator Company, Pampa, Wash., contemplates grain elevator to cost $90,000. Puget Sound Power & Light Company, Seattle, Wash., has authorized immediate work on hydro-electric power project at Rock Island, on Columbia River, for output of 240,000 hp., to cost $20,000,000. Inland Empire Paper Company, Spokane, Wash., has approved plans for extensions and improvements in mill at Millwood, Wash., to cost $300,000. Bureau of Reclamation, Denver, Colo., will receive bids until November 12 for two 330 hp. motors.

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## SOUTHWEST

—ALL MANUFACTURERS' REPRESENTATIVES *interviewed say that there has been no improvement in general business since last report. Orders coming in are still small and one manager says the number of orders is nothing to brag about.*

One of the large Portland cement companies placed an order for mechanical equipment amounting to $75,000 and the contract for motors, transformers and control will be placed in a short time. The only other orders reported are for a hydro-electric development in Arkansas consisting of set-up transformers for $100,000, oil circuit breakers $120,000 and station transformers $10,000.

#### CONSTRUCTION PROJECTS

Missouri-Pacific Railroad Company, St. Louis, Mo., plans grain elevator at Kansas City, Mo., to cost over $150,000. Flexwood Company, Chicago, Ill., reported having plans maturing for veneer plant at St. Louis, Mo., to cost $200,000. Shawnee Copper Mining Company, Eminence, Mo., plans concentrating mill to cost $100,000. Chickasha Cotton Oil Company, Chickasha, Okla., will carry out expansion program to cost over $75,000. Batesville, Ark., contemplates ornamental lighting system. Wright Motor Company, Little Rock, Ark., plans service and garage building to cost $100,000. Board of Education, Odessa, Tex., has plans for high school with manual training department to cost $175,000. Gulf, Colorado & Sante Fe Railway, Fort Worth, Tex., plans freight terminal to cost $250,000.

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## MIDDLE WEST

—A SOMEWHAT MORE DEFINITE INDICATION *of improvement in general business is noticeable this week in the Middle West section. Here and there bright spots are appearing and a feeling of reassurance for the future is being manifested. While definite results of October business are not available at this time, preliminary reports indicate an improvement.*

Renewed purchasing of equipment by the railroads is particularly gratifying, while the results obtained in the automotive industry through the production of new models appears satisfactory. The seasonal demand for coal has greatly increased the activities in the coal mining sections, while retail trade has benefited by the colder weather. Considerably more forward buying is going on and it is generally felt that the worst period of the depression is over. The various utility companies have large programs scheduled for next year and more construction work is being started at this time. Some of the interesting items placed this week include one 7,500-kva., oil-immersed, self- and water-cooled, three-phase, 60-cycle, 12,000-volt transformer, 46 induction motors to cost $96,000, and 500,000 lb. of triple-braid weatherproof wire and cable.

#### CONSTRUCTION PROJECTS

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has secured permission to build initial unit of steam-operated electric power plant at Port Washington, to cost $7,500,000. Wisconsin Power & Light Company, Madison, Wis., has authorized a hydro-electric power

plant at Wyocena, Wis. Detroit Public Lighting Commission, Detroit, Mich., has approved plans for power substation on Philip Avenue, to cost about $60,000. Clements Manufacturing Company, Chicago, Ill., plans industrial cleaning equipment manufacturing plant to cost $100,000. Hohman Plating Company, Dayton, Ohio, plans plant addition to cost $80,000. John J. Brown, Cincinnati, Ohio, architect, will prepare plans for an automobile service and garage building to cost $150,000. Oberlin College, Oberlin, Ohio, plans power plant to cost $200,000, and shops and other buildings to cost over $1,400,000. Rochester, Minn., plans ornamental lighting system to cost $26,700. Minneapolis Gas Light Company, Minneapolis, Minn., has plans for an equipment storage and service building to cost $200,000.

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# SOUTHEAST

—A FAIR VOLUME OF SMALL ORDERS, *but practically no individual orders worthy of comment, is reported for the Southeast. Reasonably satisfactory activity continues in industrial lines, with inquiries on the increase. A considerable number of inquiries are on hand for copper, but orders are being held in anticipation of a price change.*

Atlanta building permits for October amounted to $1,040,220, which is the second largest month in the year, and represents an increase of approximately $300,000 over the same month of last year. Two cars of bare copper wire were ordered in the Florida territory and a Georgia company ordered pole line materials and creosoted pine poles totaling 4,350. A middle Georgia cotton mill ordered $3,000 worth of motor equipment, and a marble quarry in North Georgia purchased $1,000 worth of line construction materials. Another Georgia mill has placed an order for motor and control equipment amounting to $10,000 and will within the near future let the contract for wiring, approximating $15,000. Georgia Power Company has purchased the distribution system in Newton, Ga., and will undertake rehabilitation on the system to the extent of approximately $9,000.

### CONSTRUCTION PROJECTS

Ahrens Trade School, Louisville, Ky., contemplates an addition to cost $250,000. Nashville, Tenn., plans extensions and improvements in municipal waterworks with installation of electric machinery to cost $400,000. Charlotte Pipe & Foundry Company, Charlotte, N. C., contemplates plant to cost $75,000. Standard Oil Company, Charlotte, N. C., plans storage and distributing plant to cost $120,000. Woodward Iron Company, Woodward, Ala., has authorized an expansion and improvement program to cost $300,000. Georgia Power Company, Atlanta, Ga., plans transmission line from Kingsland to Woodbine. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until November 18 for one motor-generator set (Schedule 4399.)

# EASTERN

—SPECIALTY ACCOUNT IS SECURING *the greater amount of interest in the New York electrical equipment market, including domestic appliances, airport lighting equipment, X-ray apparatus, etc. Meantime, central-station equipment, as well as sizable units for industrial service, are marking time and immediate demand is drifting into lagging tendencies.*

—INQUIRIES ARE THE BRIGHT SPOT *in the situation and a number of important orders for power company account are simply awaiting a date of maturity. Railways seem to be on the edge of entering the market for a considerable amount of equipment, while marine account, likewise, appears to give early promise of worth-while commitments.*

A power company in West Virginia has placed a contract with a New York manufacturer for transformers and condensers to an amount of $35,000. A municipality in Minnesota has given an order to a New York producer for exciter, switchboard and kindred equipment for a city-owned power station. Westinghouse Electric & Manufacturing Company has tendered a low figure for a 5,000-kva. generator unit for the Government Reclamation Bureau at $45,700, and is expected to receive award. The same company will furnish a steam turbo-generator for a municipal installation in North Carolina, the order for boilers going to a New York manufacturer, and for stokers to a New England producer.

Wire and cable business is slow and leading manufacturers report a sizable decline as compared with orders at this time last year. One maker says that there is growing improvement in account, with business about 50 per cent in excess of that during the summer. With a decline in stocks in the hands of users, an upward trend is looked for during the next few weeks; current orders are appreciably below those of 1929, and about 10 per cent under the record of 1928.

With a growing demand for electrical appliances for domestic service, due in part to the approaching holidays, plants in New England and Middle West report better production schedules. Wholesalers and dealers are showing fair interest in stocking up, and orders have reached the highest point this year.

### CONSTRUCTION PROJECTS

Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until November 18 for a steam turbine for the Brooklyn Navy Yard (Schedule 4404); also, until November 11 for one oil engine generating unit (Schedule 4386). Commanding Officer, Submarine Mine Depot, Fort Totten, New York, will receive bids until November 17 for ammeters, voltmeters, etc. (Circular 9). New York, New Haven & Hartford Railroad, New York, has filed plans for warehouse unit to cost $175,000. Buffalo General Electric Company, Buffalo, N. Y., has filed plans for power substation to cost $35,000. Quartermaster, United States Army, Fort Monmouth, N. J., will receive bids until November 14 for one coal conveyor (Circular 12). Public Service Electric & Gas Company, Newark, N. J., plans steel tower transmission line in Morris County, near Split Rock. Philadelphia Gas Works Company, Philadelphia, Pa., plans machine and plate shop to cost over $75,000. Liberty Dairy Products Corporation, Pittsburgh, Pa., plans extensions and improvements in three plants to cost $500,000. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until November 18 for three $CO_2$ recorders, complete with motors (Schedule 4429). Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until November 26 for one 40-ton electric gantry crane (Specification 6310.)

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# NEW ENGLAND

—ORDERS FOR SMALL MOTORS *and power control are steady. Installations of looms and weaving machinery among textile plants are gaining and orders for motors for loom drive were recently placed in good volume. Negotiations for additional power equipment of this type are under way. General scheduled material sales are steady. Interest in electric heating equipment is more active.*

Recently a 300-kw. heating pot for industrial use was placed. A number of inquiries have been recently received relative to type metal purposes. Central-station equipment orders are slack; the projected 30-mile transmission line in southeastern Massachusetts is of interest. Heavy industrial equipment interest is at a low ebb, but, on the other hand, much study is being given to renovations and additions to a number of steam power plants. Electric arc-welding units are demanding less interest, though inquiries are being received. Electric domestic appliances show a steady trend in sales; radio, refrigerators and ranges are outstanding among the major types of equipment.

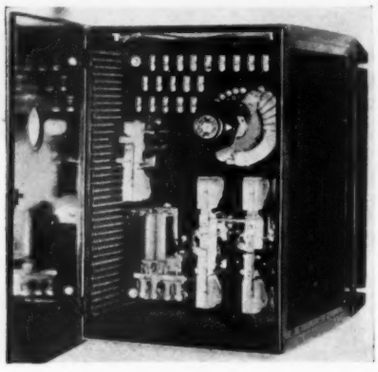
### CONSTRUCTION PROJECTS

York Manufacturing Company, Saco, Me., will make extensions and improvements in cotton mills to cost over $500,000. Dewey & Almy Chemical Company, Cambridge, Mass., has filed plans for an addition to cost over $60,000. Massachusetts Institute of Technology, Cambridge, Mass., has plans under way for physics and chemistry laboratory units to cost $2,500,000. Holyoke, Mass., will proceed with vocational training school to cost over $350,000. Narragansett Electric Company, Providence, R. I., has approved plans for a three-story power substation to cost about $65,000.

# New Equipment Available

## Controllers for Presses, Folders and Box Machines

CONTROLLERS FOR AUTOMATIC, high-speed, self-feeding presses, folders, paper-box-making machines and similar machinery for operation on either a.c. or d.c. supply are announced by the Monitor Controller Company, Baltimore, Md. These controllers furnish



automatic starting, preset speed, magnetic reversing and automatic braking.

The d.c. equipment consists of a main- and a blower-motor controller mounted on one panel and one or more operator's stations, and when required for interlocking with the press, a slow-down or trip station. The d.c. controller provides full-torque starting with proper resistance value regardless of speed setting. The a.c. outfit is the same, except that an automatic brake switch must be added. The a.c. controller has approximately 125 per cent torque at minimum speed setting and higher for higher speed settings.

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## Convenient and Reliable Round-Chart Recorders

ROUND-CHART RECORDING ammeters and voltmeters using a species of small motor structure for the measuring unit and designed principally for alternating-current service are announced by the Westinghouse Electric & Manufacturing Company, Newark, N. J. These instruments use a laminated armature core or rotor mounted in the field of an electromagnet, and they are constructed without delicate jewel or pivot bearings. Heavy spiral springs provide the control force. Convenience and reliability are the outstanding claims made for the instruments.

In one type of recorder the chart revolves once a day, or approximately 16 in. per 24 hours at normal loads. Another type has a chart speed of one revolution per week, and instruments having still other chart speeds can be developed on order.

The ammeters are made in sizes ranging from 5 amp. to 50 amp. full scale and the 5-amp. size may be used with current transformers on higher ranges. Voltmeter sizes range from 90 to 140 volts suppressed zero, and similarly suppressed-scale ranges for circuits up to 550 volts nominal. In all instruments the readings can be relied upon to be within 3 per cent of the exact, according to the manufacturer.

These recorders, designated type A, are said to be considerably smaller and lighter than other round-chart recorders with the same scale length. The case diameter is $8\frac{3}{8}$ in.

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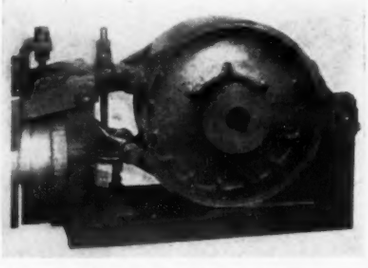
## Magnet-Operated Brakes for Heavy-Duty Motors

BAND TYPE MAGNET-OPERATED BRAKES for direct-current motors on heavy-duty service such as cranes, steel mill auxiliaries, hoists and similar applications are announced by the General Electric Company, Schenectady, N. Y.

This new brake, designated CR-9517, operates in the same way as the external-contracting-band type automobile brake. It is applied by spring and released by magnet. It can be connected to operate either in synchronism with the starting and stopping of the motor or to operate independently, the one type using a series and the other a shunt wound coil. In the case of independent action, the motor control is provided

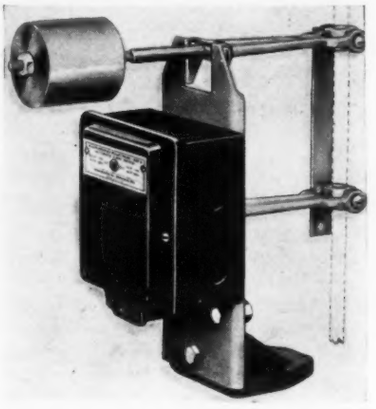


with a drift point which takes power off the motor but does not apply the brake.

Simplicity, high mechanical strength and unusually long life are the claims made for this new line of brakes.

## Automatic Float Switch for Pump-Motor Control

FLOAT SWITCHES WHICH PROVIDE automatic motor control for pumps are announced by the Allen Bradley Company, Milwaukee, Wis. This switch, Bulletin 840, is of the contactor type and is operated by an arm working against a



cam leverage, which assures a quick make-and-break of the contactor.

The size designated as B provides two-pole switching and handles a.c. motors up to $1\frac{1}{2}$ hp., 110 volts, and 3 hp., 220, 440 and 550 volts. Its d.c. rating is 1 hp., 110 or 220 volts. For larger ratings the switches can be used as pilot control for magnetic starters.

The size C switch provides three-pole switching and is rated for single-phase motors up to $1\frac{1}{2}$ hp., 110 volts, and 3 hp., 220 volts; for polyphase motors up to 3 hp., 110 volts, and 5 hp., 220, 440 and 550 volts; for d.c. service, 2 hp., 110 and 220 volts, and 1 hp., 550 volts.

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## Positive-Grip Connector for Heavy-Duty Service

POSITIVE-GRIP CLAMP TYPE T connectors of high mechanical strength and high current carrying capacity are announced by the Burk Electric Company, Erie, Pa. This connector has an auxiliary support, which relieves the strain caused by vibration and swing of the run, in the form of an arm extension from the body casting which is clamped to the tap several inches below the main clamp.

The connector and tap can be assembled on the ground and elevated as a unit to the cable run. The connector is held firmly in position on the tap by means of the auxiliary clamp. This leaves the operator with both hands free to place the hinged clamp over the run and insert the bolts quickly and with little difficulty.